
# Imperial Bureau of Plant Genetics

## (For Crops other than Herbage)

## Plant Breeding Abstracts

Vol. VI, No. 4.

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*Note.*—Initialled abstracts are written by the following :

| | |
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| Mr. H. O. Hirschfeld ... ... ... | H. O. H. |
| Dr. P. C. Ma ... ... ... ... | P. C. M. |
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| Dr. J. Wishart ... ... ... ... | J. W. |

* General studies are also individually entered.

# Plant Breeding Abstracts.

## Vol. VI, No. 4.

### Part I. British Empire

#### STATISTICS 519

1053. ALLAN, F. E. 519.2
**Some principles of statistics and their application to agricultural experiments.**
J. Aust. Inst. Agric. Sci. 1936 : **2** : 17–23.
The first of a series of four articles dealing with the elementary principles of statistical method in its application to biological research, this paper deals with the notions of probability and frequency distributions.

1054. HOLCOMB, R. and FROMAN, D. K. 519.24
**A graphical method for the rapid estimation of the standard deviation.**
Canad. J. Res. 1936 : **14** : Sect. D : 15–20.
A method of obtaining estimates of the mean and standard deviation of a population of measurements from the " ogive " curve is described.
The advantages claimed are the ease of determining the estimate of the standard deviation and the usefulness of the curve for judging the skewness of small numbers of observations.

#### GENETICS 575

1055. RAMIAH, K. 575:633
**Recent advances in plant breeding.**
Agric. Live-Stk. India 1936 : **6** : 3–10.
In this article, which is intended for practical workers, research in plant breeding is reviewed under the following heads : Breeding work in early times, Mendelism, methods of breeding and improvements in technique, range of plant material and cytological theory relating to chromosomes and mutation.

1056. 575.1
HURST, C. C. 575.11:633
**Recent work in plant breeding.**
Emp. Cott. Gr. Rev. 1936 : **13** : 99–109.
A survey of the development of the science of plant breeding and its recent trends in connexion with the utilization of induced mutations and chromosome duplications and the production of polyploid types from interspecific and intergeneric crosses. The value of expeditions in search of new wild forms with desirable qualities of yield, disease resistance, etc., is made clear. A concise summary is presented of the results that have been already achieved in the breeding of cotton, beans, cereals, lupins and rubber in Russia, China and Germany. A bibliography is appended.

1057. SCOTT-MONCRIEFF, R. 575.11.061.6:581.192:581.46
**A biochemical survey of some Mendelian factors for flower colour.**
J. Genet. 1936 : **32** : 117–70.
An extensive survey based on the published and unpublished work of the author and others, chiefly on garden plants.
The factors studied were concerned with the production of plastid pigment, the production of sap pigments (anthoxanthin and anthocyanin), the regulation of the quantity of sap pigment, modification of the chemical structure of anthocyanins and the alteration of pH in petals.

1058. STEVENS, W. L. 575.116.1:519.24
**The analysis of interference.**
J. Genet. 1936 : **32** : 51–64.
It is shewn mathematically that coincidence may be estimated consistently and efficiently by the quantity $\frac{n.n_{pq}}{n_p.n_q}$ where $n$ is the total number of individuals and $n_p$, $n_q$ and $n_{pq}$ are respectively the numbers of individuals shewing recombination in segments $p$, $q$, and in both $p$ and $q$, irrespective of what occurs in any other segments studied.
A formula is given for the variance of this quantity and the application is illustrated by examples.

## ORIGIN OF SPECIES, etc. 576.16

1059. DELBRUCK, M. and TIMOFEEFF-RESSOVSKY, N. W. 576.16:537.59
**Cosmic rays and the origin of species.**
Nature, Lond. 1936 : **137** : 358–59.
THOMAS, H. H.
**Cosmic rays and the origin of species. Reply.**
Nature, Lond. 1936 : **137** : p. 359.
A criticism of the article reviewed in " Plant Breeding Abstracts," Vol. VI, Abst. 679 suggesting that the facts therein described are capable of other explanations than those put forward. The second letter contains Dr. Hamshaw Thomas's reply.

1060. TURRILL, W. B. 576.16:575
**Contacts between plant classification and experimental botany.**
Nature, Lond. 1936 : **137** : 563–66.
Already reviewed from another source in " Plant Breeding Abstracts," Vol. VI, Abst. 450.

## CYTOLOGY 576.3

1061. MATHER, K. 576.356.5:575.114:575.116.1
**Segregation and linkage in autotetraploids.**
J. Genet. 1936 : **32** : 287–314.
A mathematical investigation of the theory of monofactorial segregation and linkage in autotetraploids.
Since segregation is dependent on the way in which eight chromatids are distributed among four gametes and since double reduction leads to sister chromatids reaching the same gamete, there is no characteristic monofactorial segregation as in diploids or allopolyploids. The frequency of double reduction is dependent on the frequency of equational separation at the locus concerned (and therefore on the genetic distance of the locus from the spindle attachment) and on the frequency of non-disjunction of the equationally separating chromosomes. The product of the two frequencies gives a quantity termed the index of separation which, it is shewn, represents the excess of recessive gametes over 4 in 8 in simplex segregation and 1 in 6 in duplex. Methods of estimating the different indices, $\alpha$ and $\beta$, in the respective cases of simplex and duplex segregation are given and illustrated by examples.
In a consideration of linkage in simplex tetraploids it is shewn that more than 50 per cent recombination gametes, but not recombination strands, can occur in the case of single coupling, but not in the case of single repulsion. Owing to the limited number of changes of partner at pachytene, coincidence values estimated in the ordinary way have little meaning and in general little faith can be placed in the accuracy of estimation of linkage values of more than 15 per cent. Methods are given and illustrated for the estimation of recombination between closely linked factors, taking into account the occurrence of double reduction.

## FIELD TESTS 631.421

1062. YATES, F. 631.421:519.241
**Incomplete Latin squares.**
J. Agric. Sci. 1936 : **26** : 301–15.

In the case of an experiment laid out in a Latin square arrangement it may sometimes happen that the whole of one row, column or treatment has to be omitted from consideration for various reasons. A row and a column, or either, together with the data for one treatment, may be missing from the data presented for analysis. The author shews how statistical analysis may be applied to these cases, the only ones in which a neat analysis is possible. Unbiased estimates of error can be obtained from such incomplete Latin squares, which are therefore valid experimental arrangements, likely to be made use of deliberately in cases where the adoption of a full Latin square design is not possible owing to the number in one or both of the natural groups being one less than the number of treatments to be tested. J.W.

1063. BARTLETT, M. S. and GREENHILL, A. W. 631.421:631.557:519.24
**The relative importance of plot variation and of field and laboratory sampling errors in small plot pasture productivity experiments.**
J. Agric. Sci. 1936 : **26** : 258–62.

The authors analysed the variability of the percentage of dry matter and percentage of nitrogen determinations obtained from the data of part of an experiment involving six manurial treatments in randomized blocks. Two blocks only were taken, and there were duplicate samples of fresh herbage taken from each of the twelve plots, while for final laboratory determinations two sub-samples were taken from each sample. In both determinations the plot variance was about two thirds of the whole, that due to sampling and sub-sampling being one-fifth and one-seventh respectively. It is concluded that little advantage is gained by taking duplicate samples either in the field or in the laboratory : any material reduction in the experimental error can be expected only by reducing the plot variation, e.g. by increasing the number of replications in the field. J.W.

## PLANT DISEASES 632

1064. BOND, T. E. T. 632–1.521.6:575.25
**Disease relationships in grafted plants and chimaeras.**
Biol. Rev. 1936 : **11** : 269–85.

Grafting as an experimental method of investigating the nature of disease resistance and susceptibility, and in the interpretation of " graft-hybrids " and chimaeras is discussed. Much of the paper is based on its extensive bibliography.

1065. ADAM, D. B. AND PUGSLEY, A. T. 632.3:576.16:635.652
**" Smooth-rough " variation in *Phytomonas medicaginis phaseolicola* Burk.**
Aust. J. Exp. Biol. Med. Sci. 1934 : **12** : 193–202.

Two forms *S* and *R* of *P. medicaginis phaseolicola* have been identified. The features characterizing the colony form of the new types and accompanying changes in agglutination, bacteriophage sensitivity and virulence are described. The *R* strain was less virulent than the *S*, while a third variant *" RV "* was non-pathogenic to the bean plant.

1066. 632.452 *P. glumarum* :576.16(71)
NEWTON, M. and JOHNSON, T. 633.1–2.452–1.521.6:581.036
**Stripe rust, *Puccinia glumarum*, in Canada.**
Canad. J. Res. 1936 : **14** : Sect. C : 89–108.

Temperature was found to have a marked effect on the germinaton of uredospores of *P. glumarum*, on their longevity and on the development of uredia on inoculated wheat, plants kept at about 25°C. even for only 12 hours a day, being resistant, while at about 13°C. they were susceptible. This sensitivity to temperature appears to be an important factor in determining the distribution of the rust in Canada.

Four physiological forms were found in the collections studied, form 4 from England, form 6 from Germany and forms 8 and 13 from Canada and the U.S.A., form 13 being the more widespread in Canada.
The resistance of 52 varieties of wheat to the four forms was determined and the results indicate that lines bearing genetical factors for resistance to stripe rust should be readily available if needed.
The same forms were found to attack certain varieties of barley and certain grasses and hence the doubts expressed by other workers (Cf. " Plant Breeding Abstracts," Vol. V, Abst. 298) about the validity of Eriksson's division of *P. glumarum* into five specialized varieties are confirmed.

1067. KUNKEL, L. O. 632.8:576.16
**Recent advances in studies on plant virus diseases.**
25th and 26th Rep. Quebec Soc. Prot. Pl. (1932/34) 1934 : 23–33.
Mention is made of the occurrence of variant strains of the tobacco mosaic virus (cf. also Absts. 1187 and 1188).

## WHEAT 633.11

1068. PAL, B. P. 633.11:575.125
**Hybrid vigour in wheat.**
Indian J. Agric. Sci. 1935 : **5** : 693–704.
A summary of the article abstracted in " Plant Breeding Abstracts," Vol. V, Abst. 207.

1069. SMITH, H. F. 633.11–1.557:575
**On analysing the yield of wheat varieties.**
Rep. Melbourne (1935) Mtg. Aust. Ass. Adv. Sci. 1935 : 1 page. (Abst.)
Observations for two years on the component parts of yield in wheat on ten Australian varieties shewed that there exists close negative correlation of ear number per plant and grain number per ear and a positive correlation of grain number per ear and weight per grain. The importance of these in breeding for yield is discussed.
Size of grain is of first importance when selecting for yield, the ear number and ear size follow only when the first two are fixed.

1070. PAL, B. P. 633.11–2.452–1.521.6:575(54)
**Effects of brown rust attack on wheat.**
Indian J. Agric. Sci. 1936 : **6** : 127–28.
The author recapitulates the results obtained by other workers and points out the position with regard to brown rust of wheat in India. It is stated that though the newer wheat varieties bred at Pusa are resistant to one of the two physiological forms of brown rust recorded in India, none of the indigenous wheats so far tested is resistant to both. Work has been commenced with the object of producing strains of wheat resistant to these and also to forms of black and yellow rust.
B.P.P.

1071. ANDERSON, J. A. 633.11–2.452–1.521.6:581.192
**Studies on the nature of rust resistance in wheat. VII. Chemical analyses of hybrid lines of wheat differing in their rust reactions.**
Canad. J. Res. 1936 : **14** : Sect. C : 1–10.
Lines of wheat from a Marquis x H–44–24 cross, representing all the four possible combinations of seedling and mature plant reaction to stem rust, but random samples as regards other characters, were used in the experiments reported. They were analysed to determine differences in the main groups of plant compounds, fats, mono- and disaccharides, nitrogen compounds, hemicellulose, lignin, ash and so on ; quantitative extractions were also made with the following organic solvents in series : ligroin, ether, chloroform, ethyl acetate, acetone and ethyl alcohol. The analyses were planned so as to admit of statistical analysis of the results and by this method significant differences were detected between the groups but none of these differences were such as could be interpreted as related to rust reaction.
It is considered, however, that the results represent the first step in an attack on the problem of rust resistance by analytical chemistry, which is the purpose the work was intended to serve.

## OATS 633.13

1072. 633.13 Ceirch Llwyd Cwta S. 171
633.13:575

**New varieties and strains from the Welsh Plant Breeding Station. A new oat variety for hill land Ceirch Llwyd Cwta (S. 171) and Farmers' Associations for the growing and marketing of seed oats in Wales.**

Leafl. Welsh Pl. Breed. Sta. 1936 : No. 3 : (Ser. S). Pp. 14.

In continuation of the work referred to in " Plant Breeding Abstracts," Vol. I, Abst. 452, the new variety S.171 has been bred from an *Avena strigosa* x *A. brevis* cross made in order to combine the desirable grain characters of reduced awn and relatively lower husk percentage of the latter with the straw characters found in the former.

In field trials S.171 has given good results as regards yield, type of grain and straw production. The botanical diagnosis of the new form is given and the contrasting characters as compared with Ceirch Llwyd (S.78) are mentioned and illustrated by photographs.

1073. 633.13:581.48:575.061

**Huskless oats.**

J. Minist. Agric. 1936 : **43** : 8–10.

**Huskless oats.**

Nature, Lond. 1936 : **137** : p. 355.

The huskless type of oats in which the grain is not gripped tightly by the husk and the spikelet has 6 or 7 grains instead of 2 or 3 is described, with observations on their occurrence in Ireland and England in past years. The main source of the huskless oats now in existence is China. These Chinese oats have been used in Europe and America in attempts to breed a normal oat with more grains per spikelet, but no economically useful results have been obtained and it seems unlikely that the huskless oat has any value for cultivation in England either.

## MAIZE 633.15

1074. Toit, J. J. du 633.15–1.531.12

**Selection of seed-maize during April.**

Fmg. S. Afr. 1936 : **11** : 139, 140.

Seed maize should be selected in the field at the end of March or in April when early maturing plants can be identified. The main features that may serve as criteria for selection are enumerated and the method of storage and the subsequent germination tests are mentioned.

The necessary limitations of the activity of the official plant breeding institutions as regards the production of seed maize are pointed out and the importance is urged of promoting the establishment of seed maize growers' associations under the auspices of the Schools of Agriculture as recommended by the Department of Agriculture and Forestry.

## MILLETS AND SORGHUMS 633.17

1075. Rangaswami Ayyangar, G. N., 633.171:581.46:581.48
Pillai, V. G. and Hariharan, P. V.

**Studies on *Pennisetum typhoides* (Burm.) Stapf. and Hubbard [Syn. *P. typhoideum* (Rich)]—The pearl millet, Part II. Spikelet-bearing bristles.**

Indian J. Agric. Sci. 1935 : **5** : 638–40.

Bristles may bear spikelets some of which contain grains capable of germination. The author is of opinion that such spikelet-carrying bristles are prolongations of the axis of the fascicle.

B.P.P.

1076. 633.174:575(54.8)
Rangaswami Ayyangar, G. N. 633.62:581.192:575.11

**Juiciness and sweetness in sorghum stalks.**

Madras Agric. J. 1935 : **23** : 350–52.

It has been found that the character pithiness of stalk, associated with white midribs, is a simple dominant to juiciness, associated with dull midribs. In both juicy and pithy families monohybrid

segregation for sweetness and insipidity have been observed, the latter being dominant, while an instance of dihybrid segregation for the two pairs of characters has shewn that they are independent.
The extraction of juice was 17 to 20 per cent in pithy stalks as compared to 33 to 48 per cent in juicy stalks while there was a difference of about $3\frac{1}{2}$ per cent in Brix value between sweet and insipid types, a similar difference being observed in sucrose content.
As sorghum is usually cultivated for grain and fodder in India, the higher survival value of pithy types has led to a preponderance of pithy, sweet varieties, though in favourable areas juicy, sweet varieties are to be found. The other two possible types lacking sweetness are comparatively rare.
Efforts are being made at the Millets Breeding Station, Coimbatore, to introduce juiciness and sweetness into varieties lacking these characters without impairing their yield of grain.

1077. 633.174 *S. papyrascens* : 575.242
RANGASWAMI AYYANGAR, G. N. and PANDURANGA RAO, V.
***Sorghum papyrascens* Stapf.**
J. Indian Bot. Soc. 1936 : **15** : 139–42.
The species *S. papyrascens* Stapf. is characterized by long papery glumes, irregular flowering and poor setting of grain. The defects in grain setting are not due to the pollen, which is perfectly viable, nor to the stigmas, which respond readily to foreign pollen and it is suggested therefore that they are traceable to the papery glumes.
The occurrence of plants like *S. papyrascens* in the field suggest that it is a mutant, which is supported by the fact that its characters behave, *en bloc*, as a simple recessive in crosses with *S. durra*. The gene concerned is named *py*, giving a papery glume and the attendant irregular flowering and poor setting.

1078. RANGASWAMI AYYANGAR, G. N., PONNAIYA, B. W. X. and VENKATARAMANA REDDY, T. 633.174:581.45:581.46:575.114.3
**Forked awns and leaf-blades in sorghum.**
Curr. Sci. 1935 : **4** : 316–17.
Manifestation of a rare and probably atavistic abnormality in two homologous organs in a single plant selection.

1079. 633.174:581.48:575
RANGASWAMI AYYANGAR, G. N. and PANDURANGA RAO, V.
**Multiple seededness in sorghum and consequent repercussions.**
Madras Agric. J. 1936 : **24** : 15–18.
Two independent ways in which the number of grains per floret may be increased are described. Occurring together, these may give rise to as many as six grains. Crosses between double-seeded and single-seeded varieties have given double seeded $F_1$s ; further generations have not yet been obtained.
Other floral irregularities were noted during the study, supporting the view that the grass flower is hexamerous.

1080. WYK, N. J. VAN 633.174–1.531.12
**Selecting kaffir-corn seed.**
Fmg. S. Afr. 1936 : **11** : p. 166.
Full directions on the identification of desirable varieties, the best types of ear and plant and the allowance to be made for environmental conditions in selection.

## RICE 633.18

1081. CHAKRAVERTTI, S. C., BOSE, S. S. and MAHALANOBIS, P. C. 633.18–1.421:519.24
**Statistical notes for agricultural workers. No. 16—A complex experiment on rice at the Chinsurah Farm, Bengal, 1933-34.**
Indian J. Agric. Sci. 1936 : **6** : 34–51.

The results and analysis of a fourfold complex experiment on rice are presented. The treatments comprised three varieties of rice, five dates of planting, three spacings and three different numbers of seedlings per hole. With three replications there was a total of 405 plots.

The analysis of variance shewed that all the primary effects were significant ; the first order interactions between date of planting and variety and between date of planting and spacing were also significant ; significant second order interactions were found between date of planting, variety and number of seedlings per hole and between date of planting, variety and spacing. The third order interaction is inappreciable.

With a view to obtaining information on the seasonal influence the experiment is being repeated for three consecutive years.

## ROOTS AND TUBERS 633.4

1082. 633.42–2.411–1.521.6
**Swede and turnip variety trials. Varieties resistant to finger-and-toe disease.**
Adv. Rep. Somerset Fm. Inst. 1935 : 37–46.

The varieties Wilhelmsburger, Kelway's Immunity Bronze-Top and the Herning strain of Bangholm Purple-Top all proved fairly resistant. In general the degree of resistance was high and even where not satisfactory owing to severe conditions of infection it was much greater than that of other varieties. Average yield figures are given from the above three swedes which are recommended for use where finger-and-toe is prevalent.

As regards turnips, The Bruce Purple Top, a hardy rather slow maturing type, proved even more resistant than Victor Achilles both to finger-and-toe and to frost damage. It should be noted, however, that a number of strains of purple top turnips sold under the name of The Bruce differ widely in resistance. A green top selection of The Bruce, called The Wallace appears to differ from the purple top in having a higher yielding capacity but less hardiness.

1083. 633.491:575(41)
O'BRIEN, D. G. 633.491–1. 531.12(41)
**Potato growing and research in Scotland.**
Sci. Hort. 1936 : **4** : 30–37.

This article includes a note on the new varieties bred in the past and in recent years in Scotland. The criteria for registration as a new variety and the certification of seed are also mentioned.

1084. CRANE, M. B. 633.491:575.255:576.312.34
**Note on a periclinal chimaera in the potato.**
J. Genet. 1936 : **32** : 73–77.

By removing the eyes from tubers of the russet-skinned variety Golden Wonder and so causing adventitious shoots to develop from the internal tissue, it was found that most of the plants obtained gave white skinned tubers closely resembling those of the variety Langworthy, from which Golden Wonder is generally assumed to have arisen by a somatic mutation. It is thus shewn that Golden Wonder is a periclinal chimaera with a core of Langworthy tissue, and hence the root tip chromosomes of the two varieties should be identical. They have previously been reported to be different (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 194), but in a note in the present paper it is stated that no such differences could be observed.

1085. 633.51:575(54)

**Annual Report of the Indian Central Cotton Committee for the year ending 31st August, 1935.**

Bombay, 1936 : Pp. 192.

In the chapter dealing with research the progress of the different schemes (Cf. " Plant Breeding Abstracts," Suppl. II, pages 24–27) is reported.

Selection 4714 might be said to have fulfilled the aim of the Madras *Herbaceum* scheme if it behaves in the same way in years of good rains as it did in the past year of insufficient rainfall, outyielding the control by 75 per cent and giving a lint length of 26 mm., a ginning outturn of 29 per cent and a spinning value estimated at 28's. In connexion with the Madras *Pempheres* and Physiological Scheme a few crosses between Co.2 and some South American types which were found to be resistant to the weevil have been back-crossed to Co.2 with a view to obtaining resistant types. The work on the Nadam Cotton Breeding Scheme indicates good prospects of obtaining an annual type to replace the perennial Nadam.

In Bombay Presidency several wilt-resistant strains have been selected from crosses, giving ginning outturns of 35 per cent or over and with fibre lengths between 20 and 23 mm., in connexion with the Broach Cotton Breeding Scheme. Wilt-resistant strains superior to Banilla in fibre length have been selected in connexion with the Jalgaon Cotton Breeding Scheme.

In connexion with breeding under the Baroda Root Rot Scheme, two varieties, Rozi and Karkhadi, and two pure strains, Broach 8 and 9, have been found more tolerant of the disease than other varieties grown in Gujerat. A few selections have been made from some pure types. *Rhizoctonia* has been found to be the real cause of the disease, entering the roots through the injuries caused by nematodes.

Work in the Punjab Botanical Scheme has been concentrated on the breeding side, the study of the periodic failures of American cottons now being the task of the Physiological Scheme started in March 1935. In connexion with the Botanical Scheme the strain 43 F, an early, jassid-resistant type with $1\frac{1}{16}$ in. staple length and capable of spinning up to 44's has been finally chosen for general distribution in the province, while the testing of other strains continues.

Three strains are now being distributed in the Central Provinces in connexion with the Botanical Scheme, to replace V.262. The best is V.434, a prolific drought-resistant form capable of spinning up to 37's ; Late Verum spins up to 36's and is suitable for districts where the rainfall is heavy and the monsoon extends late in the season, while V.438 is suitable for soils of a lighter description. Gaorani 4 and 6 were the two best strains in tests in the Hyderabad Botanical Research Scheme and it is proposed to distribute their seed in the next season for about 1,000 and 600 acres respectively.

In the Bikaner Gang Canal Scheme the desi type, Cawnpore 520, has proved the best suited to the Gang Canal area, followed by Mollisoni.

The work of the Technological Laboratory is also reported, including the testing of new strains.

1086. HUTCHINSON, J. B. and GADKARI, P. D. 633.51:575.11:581.162.5

**A note on the inheritance of sterility in cotton.**

Indian J. Agric. Sci. 1935 : **5** : 619–23.

Seeds obtained by selfing an almost sterile plant in a crop of " Million Dollar " cotton gave eleven highly sterile plants. Two successful crosses were obtained between these and normal " Million Dollar " plants. The $F_1$'s were completely fertile. The breeding behaviour in subsequent generations indicated that there was a single-factor difference between fertility and sterility, the former being dominant. B.P.P.

1087. 633.51:677.1:578.081

AHMAD, NAZIR 633.51.00.14:677.1

**Cotton research in India, being an account of the work done at the Indian Central Cotton Committee Technological Laboratory, 1924-1935.**

Bombay, 1936 : Pp. 100.

Among the activities of the Indian Central Cotton Committee recorded in this report are the spinning tests of improved varieties, made for cotton breeders, and also tests of samples in connexion with various field experiments designed to ascertain the effect of various environmental factors on lint quality.

1088. Patel, B. S. and Srinagabhushana, 633.51:677.1:581.5(54)
**Variation in the properties of similar strains of cotton grown in different tracts of Gujarat.**
Indian J. Agric. Sci. 1936 : **6** : 63–71.
The fibre properties of a number of cottons grown in the Broach, Surat and Viramgam tracts were compared.
The samples from Broach shewed the lowest irregularity percentage, the lowest fibre-weight per inch (and hence the least coarseness), and the lowest fibre-maturity percentage. The samples from Viramgam, on the other hand, shewed the highest fibre-weight per inch and the highest fibre-maturity percentage ; in respect of irregularity percentage they were like those from Surat. The Surat samples generally occupied an intermediate position.
While the variations in mean fibre-length were not significant there seemed to be slight alterations in the percentage distribution of fibres of different lengths, from tract to tract. B.P.P.

1089. 633.52:575(41.5)
**Flax seed, 1936.**
Leafl. Govt. N. Ire., Minist. Agric. 1936 : No. 1 : Pp. 6.
A revision of the leaflet reviewed in " Plant Breeding Abstracts " Vol. IV, Abst. 563. The supply of pure seed of the new varieties from pure strains grown in Canada may begin this season.

1090. Lock, G. W. 633.526.23–1.421:575
**Programme for an agronomic investigation of sisal (*Agave sisalana*, Perrine).**
Pamphl. Dep. Agric. Tanganyika 1935 : No. 14 : Pp. 17.
The application of modern methods of field experimentation to sisal is described in this preliminary account of the work to be done on the crop in Tanganyika.
The experiments contemplated include a variety trial in which *Agave sisalana*, *A. amaniensis*, *A. cantala* and *A. fourcroydes* will be included.
Breeding work lies in the province of the Geneticist at Amani.

1091. 633.584.3:634.98:575
**Report of the Forest Products Research Board with the Report of the Director of Forest Products Research for the year 1933.**
Dep. Sci. Industr. Res., Lond. 1934 : Pp. 67.
**Report of the Forest Products Research Board with the Report of the Director of Forest Products Research for the year 1934.**
Dep. Sci. Industr. Res., Lond. 1935 : Pp. 75.
The Forest Products Research Laboratory is collaborating with the Imperial Forestry Institute, the Forestry Commission, willow growers and bat makers in an endeavour to determine, *inter alia*, the most suitable willow species, varieties or hybrids for making cricket bats.
The growth features of certain selected trees have been examined and a detailed investigation of the wood structure is being made. Bats manufactured at the laboratory have been tested by professional cricketers and their reports will be compared with results of mechanical tests now to be made on comparable samples of wood.

## SUGAR PLANTS 633.6

1092. Dodds, H. H. 633.61(68)
**Outline of scientific progress in the S.A. Sugar Industry. Early history of cane in South Africa.**
S. Afr. Sug. J. 1936 : **20** : 33–45.
Observations on the introduction and cultivation of sugar cane and its numerous varieties in South Africa and on the establishment of the Experiment station at Mount Edgecombe and the cooperative field stations on private estates. The collection of canes from various countries and the methods of testing new varieties such as the Coimbatore canes are described.

1093. 633.61:575

**Improvement of canes through breeding.**

S. Afr. Sug. J. 1936 : **20** : p. 77.

A brief account of the production of new varieties by bud mutation and sexual reproduction.

1094. 633.61:575(68.4)

**Natal Sugar Experiment Station notes.**

S. Afr. Sug. J. 1936 : **20** : 81–87.

Brief observations are made on recent additions and a list of the varieties in the collection of cane varieties in January 1936 is given.

True seed from three crosses of P.O.J.2725 with three Coimbatore canes is being sent to the station from Coimbatore.

1095. H.M.L. 633.61:575(69.82)

**Sugar cane investigations in Mauritius. Fifth Annual Report of the Sugar Cane Research Station in Mauritius, 1934.**

Int. Sug. J. 1936 : **38** : 86–89.

The main items of interest to plant breeders have already been reviewed (Cf. " Plant Breeding Abstracts," Vol. VI, Absts. 70 and 372).

1096. 633.61:575(72.98)

**Report of the Geneticist for the year ending September 30, 1935.**

Rep. B. W. I. Cent. Sug. Cane Breed. Sta. 1935 : Pp. 25.

The main part of this report, dealing with sugar cane breeding has already been reviewed (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 726).

A list is given of the seedlings sent to the Central Plant Quarantine Station in Trinidad and mention is made of the consideration being given to the varietal requirements of the different islands of the British West Indies.

The seedlings on which growth measurements and maturity data have been obtained during the year under review are listed.

It has been found possible by employing certain field sampling methods to obtain sufficiently accurate indications of sucrose in juice of first and second year seedlings with a Zeiss hand refractometer. This will facilitate this aspect of the work in seedling selection.

In experiments on fuzz storage, the best germination after eight months storage was 25 per cent, obtained from fuzz stored with calcium chloride in an atmosphere of carbon dioxide. It is concluded that fuzz storage in Barbados with the treatments used is not suited to the scheme of breeding employed.

Further experiments will be made with the object of improving viability after storage and noting to what extent percentage of germination in crosses after storage is a genetic characteristic.

The studies on root systems and on gumming disease (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 375) have been continued.

1097. 633.61:575(88)
633.61.00.14(88)

DASH, J. S. 633.174:575.127.5:633.61

**What's new in agriculture.**

Agric. J. Brit. Guiana 1936 : **7** : 45–50.

In this broadcast speech on tropical agriculture an account is given of the testing of new cane varieties in British Guiana. Among the new seedlings D.66/30, D.11/28 and D.49/30, which are related to some of the world's best canes, are in demand. Several hundred crosses have also been obtained between *Sorghum* and *Saccharum* and first crosses are being back-crossed to cane to dilute the *Sorghum* characters and enhance those of cane.

The new canes obtained from suitable combinations are being tested as plants and ratoons. Some of the imported seedlings which are also being tested appear very promising.

1098. BELL, A. F. 633.61:575(94.3)
**Variation of varietal constitution of the cane crops of the Mackay and Bundaberg districts.**
Proc. Qd. Soc. Sug. Cane Techn. 7th Annu. Conf. 1936 : 133-36.
In the Mackay district, where disease has played a relatively unimportant part in the discarding or adoption of different varieties, there has been a steady replacement of low sugar content canes such as D.1135 and Malagache by sweeter canes, in particular 1900 Seedling. Recently P.O.J. varieties have made their appearance.
In the Bundaberg district the fluctuations are rather more sudden, owing to the incidence of disease, in particular gumming disease. In general there has been a great decline in the cultivation of D.1135 and to a certain extent of 1900 Seedling with, in recent years, an increase in the newer Java and Coimbatore varieties.

1099. H.M.L. 633.61:575(94.3)
**The sugar cane in Queensland.**
Sixth Annual Conference, Queensland Society of Sugar Cane Technologists. Int. Sug. J. 1936 : **38** : 52–54.
A review of the conference report.
In recent years Glagah and *Saccharum robustum* have been introduced into the parentage of the Q seedlings with promising results ; the nobilization of Uba has been less promising. NG 15 (Badila) is the most productive parent in second and third nobilizations.
Disease resistance is an important requirement for Queensland, which possesses all the major diseases of sugar cane. In the south Q 813 saved the industry from ruin by gumming disease, but lacks hardiness and is outyielded by other resistant varieties, e.g. POJ 2878, 2725, 234 and Co. 290.
The results of preliminary variety trials at Bingera Plantaton are also briefly reported.

1100. WILLIAMS, C. H. B. and CAMERON, C. 633.61:575.127.5:633.174
**Fertile sugar cane x millet hybrid.**
Nature, Lond. 1936 : **137** : p. 830.
A letter drawing attention to a case of fertility in a *Saccharum* x *Sorghum* hybrid, of which there is a photograph displaying the seeds germinating in the inflorescence.

1101. 633.61:576.312.35
JANAKI-AMMAL, E. K. and SINGH, T. S. N. 633.61:576.356.5
**Cyto-genetic analysis of *Saccharum spontaneum* L. 2. A. type from Burma.**
Indian J. Agric. Sci. 1936 : **6** : 9-10.
Root tip counts of a tall variety obtained from Burma shewed 96 chromosomes at somatic metaphase. It is therefore considered to be a triploid resulting either from a natural cross between an Indian form with n = 32 and a tetraploid form like the " gigas " form of Sumatra, or from the fertilization of an abnormal diploid gamete with a haploid one.
The single arrow produced by the variety at Coimbatore yielded a number of seedlings which varied in morphological characters and shewed chromosome numbers ranging from 96 to 124 at somatic metaphase. B.P.P.

1102. 633.61:576.312.35:576.354.46
JANAKI-AMMAL, E. K. 633.61:576.356.5
**Cyto-genetic analysis of *Saccharum spontaneum* L. 1. Chromosome studies in some Indian forms.**
Indian J. Agric. Sci. 1936 : **6** : 1–8.
Types of *S. spontaneum* obtained from Lahore, Dehra Dun, Coimbatore, Rellagaddi, Bihar, Cochin, Dacca, and a seedling from the Dacca form, were found to have the following (2n) chromosome numbers respectively : 48, 56, 64, 64, 64,|64, 80 and 80. The chromosomes were found to vary both in size and morphology ; both primary and secondary constrictions were found.
Chromosomes are always associated as bivalents except in the type from Rellagaddi in which a

single tetravalent was observed. With the exception of Rellagaddi, no multivalents have been noted and the author concludes from the absence of these that polyploidy in this species must have arisen through hybridization and not through somatic duplicaton of chromosome sets.
In respect of chiasma behaviour, the chromosomes of the types of *S. spontaneum* examined fall into two types, namely (1) those with a single chiasma which is localized, (2) those with one or two chiasmata which are formed at random. The latter have a fairly high degree of terminalization.
The number of chiasmata observed is not always proportional to the length of the chromosomes. Secondary association of bivalents has also been observed and there is some evidence of hybridity within the species. B.P.P.

1103. Batham, H. N. and Nigam, L. S. 633.61–1.557:581.145.1
**Flowering of Coimbatore canes in the United Provinces.**
Agric. Live-Stk. India 1936 : **6** : 25–42.
Arrowing may take place in Northern India under the influence of heavy rainfall, high temperature and humidity.
Data are cited to shew that flowering tends to increase both yield (as represented by tonnage and amount of juice) and sucrose content. The glucose content is however less in flowered canes.

1104. 633.61–2.3–1.521.6:575(94.4)
North, D. S. 632.3:576.16:633.61
**The gumming disease of the sugar cane. Its dissemination and control.**
Agric. Rep. Colon. Sug. Refg. Co. 1935 : No. 10 (Tech.) : Pp. 149.
A full account of gumming disease and the organism, *Bacterium vascularum* (Cobb) Grieg-Smith, special attention being paid to the problems of dissemination and control.
Though stable variants can be isolated from stem and other tissues at advanced stages of the disease and from cultures, they are not considered to be varieties, but more probably degenerate forms.
The most important measure of control is the growing of resistant varieties. The method of determining the reaction of varieties to the disease is described in detail and consists of growing them in plots with fringe rows of an inoculated susceptible variety for infection purposes. Several plots of a standard variety of known resistance are included for comparison, as the resistance of varieties varies considerably according to the climatic conditions. Resistance can be divided into three main parts : resistance to leaf infection, resistance to systemic infection and tolerance of the latter, for in some varieties gummed stalks may survive and continue to grow more or less normally. Such varieties are preferred for the fringe rows in the resistance trials. By measuring the amount of leaf infection and the proportion of wilted or dead stalks and comparing these with the results obtained from standard varieties, the varieties in the trial can be classified as resistant, border-line or susceptible. The different types of resistance must be considered singly and in combination as weakness in one may be compensated for by strength in another. From the commercial point of view the finer shades of resistance and susceptibility are outweighed by cropping ability. It has been found possible, owing to the consistency of the results, to reduce the size of the plot in these trials, until now the original seedling stools are tested, an inoculated stool of a susceptible variety being grown next to them for infection. In this way susceptible seedlings can be discarded immediately. The trials are not usually continued beyond the 14 months plant cane stage, as after this period infected stools usually begin to recover.
For inheritance studies it might be necessary to determine the three factors in resistance separately but from the commercial point of view the proportion of wilted or dead stalks is more important than the proportion of gummed stalks.
Gum-free setts can usually be selected even from infected stools, but if not, the warm water treatment can be applied, 2 to 2½ hours at 50°C. for gummed setts and 1¼ hours for infected but apparently gum-free setts.

The main basis of resistance appears to be physiological. The relation between susceptibility and acidity of sap was not clear. Varieties with stiff erect leaves are as a rule more resistant and less apt to disseminate the disease than those with drooping leaves.
The resistance of a number of varieties and the capacity of some of them for producing resistant seedlings are described. P.O.J. 2878 and certain other Kassoer derivatives are classed as commercially immune and produce a high proportion (90 per cent or more) of resistant seedlings. All the commercially immune varieties have wild *Saccharum* species in their parentage, though the converse is not true. In general it is estimated that in miscellaneous unselected collections of *S. officinarum* probably less than 10 per cent are sufficiently resistant for New South Wales conditions, hence the importance of breeding for resistance. Crosses have to be performed in a tropical part of Queensland as the climate of New South Wales is not suitable for breeding work. P.O.J. 2878 is proving a very popular variety but suffers from Fiji disease and hence one of the aims of breeding is to produce a variety combining the qualities of P.O.J.2878 with resistance to Fiji disease.

## STIMULANTS 633.7

1105. Smith-White, S., MacIndoe, S. L. and Atkinson, W. T. 633.71–2.411.4–1.521.6:575

**Resistance of *Nicotiana* species to blue mould (*Peronospora tabacina* Adam.).**

J. Aust. Inst. Agric. Sci. 1936 : **2** : 26–29.

As a preliminary to breeding operations over 250 varieties and strains of *N. Tabacum*, 21 varieties of *N. rustica*, and a number of introduced and native species of *Nicotiana* were tested for resistance to *P. tabacina* Adam. Though certain geographical groups of *N. Tabacum* shewed a slight degree of tolerance no seedling resistance likely to be of use for breeding purposes was noted ; and the same may be said of the *N. rustica* group though the degree of tolerance was somewhat higher than in the first mentioned species. Moreover, none of the introduced species (including several species hybrids obtained from Russia) gave any better results than *N. rustica*. *N. Bigelovii* var. *quadrivalvis*, *N. campanulata*, *N. nudicaulis* and *N. quadrivalvis* displayed the greatest resistance but not equal to the more resistant *N. rustica* varieties. However, it is suggested that some of the introduced species, if more compatible with *N. Tabacum* may be of value for breeding.
Tests of a large number of Australian species shewed that high resistance and even in some cases apparently immunity was present. Of the five species thought to be immune *N. Debneyi* may prove of value in hybridization.
The discovery of high resistance only in Australian species of *Nicotiana* is regarded as of possible significance in regard to the origin of the blue mould fungus.

1106. Bordeleau, R. 633.71–2.42–1.521.6(71.4)

**The black rot of tobacco in the province of Quebec.**

25th and 26th Rep. Quebec Soc. Prot. Pl. (1932/34) 1934 : 135–39.

*Inter alia* the growing of resistant varieties is recommended as a control measure against *Thielavia basicola*. Resistant Havana is recommended for districts where it is not disliked by the buyers ; otherwise the less resistant Cornstock Spanish Pomeroy can be grown.

1107. 633.73:575(54.8)
633.83:575(54.8)

**Souvenir handbook of the Coffee Experiment Station, Balehonnur. Published in commemoration of the opening of the Station and Laboratories by H.H. the Maharaja of Mysore.**

Circ. Mysore Coffee Exp. Sta. 1934 : No. 3 : Pp. 11.

The activities of the station are briefly described and illustrated by several photographs and a map.
Breeding forms part of the work on coffee, its object being to secure an increased vigour of the plant associated with disease resistance and an increased yield of a superior quality of coffee.

A collection of all the important species, types and strains of coffee has been made, amounting to about 7,000 plants. Field observations are supplemented by laboratory tests on disease resistance and viability of pollen. Seed has been obtained by cross-pollination.
On account of its importance as a subsidiary crop on many coffee estates breeding work has also been taken up with cardamoms.

1108. GILBERT, S. M. 633.73:575(67.8)
**The objects and scope of the Coffee Research and Experimental Station.**
Pamphl. Dep. Agric. Tanganyika 1935 : No. **15** : Pp. 10.
The station is situated at Lyamungu on the southern slopes of Mount Kilimanjaro, its main object being to find improved economic means of producing coffee, taking into consideration liquoring quality, appearance, yield and resistance to diseases and pests.
One of the lines of work is plant breeding, in conjunction with the East African Agricultural Research Station, Amani. A survey of the range of variability shewn by coffee in regard to economic characters such as quality, yield, appearance, etc. was begun in 1934, individual tree records being taken on 12 estates, with a view to the future selection of mother trees. The self-fertilization of selected trees and study of their progeny has also been started, selfing being done at Amani and field trials carried out at the station.
Rootstocks are also being investigated in relation to their effect on scions.

1109. MCDONALD, J. 633.73–2–1.521.6
**Final report on coffee berry disease investigations in 1935.**
Mon. Bull. Coffee Bd. Kenya 1936 : **2** : p. 74.
A number of seedling varieties that are being tested for resistance to the disease are beginning to come into bearing.
The Blue Mountain variety is accepted by the writer as highly resistant. Its average yield for a 5 year period at Nairobi was 4.56 cwts. per acre as compared with 4.86 from plots of Mocha of comparable age. (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 736).

1110. 633.73–2.452–1.521.6
**Coffee Research and Experiment Station, Lyamungo, Moshi. Monthly notes No. 5.**
Planter 1936 : **4** : No. 7 : p. 8 and No. 8 : 6–8.
On one plantation a few trees are believed to shew resistance to *Hemileia* and cuttings are being propagated for resistance tests next season.

## OIL PLANTS 633.85

1111. 633.853.48:576.312.35
633.853.48:576.354.4
633.853.49:576.312.35
ALAM, Z. 633.42:576.354.4:576.16
**Cytological studies of some Indian oleiferous Cruciferae. III.**
Ann. Bot., Lond. 1936 : **50** : 85–102.
Somatic chromosome counts in *Eruca sativa* and four *Brassica* species shewed the following chromosome numbers *E. sativa* 2n = 22, *B. trilocularis* 2n = 20, *B. campestris* subsp. *campestris* var. *dichotoma* 2n = 20, *B. campestris* subsp. *rapus* var. *toria* 2n = 20 and *B. juncea* 2n = 36—all corroborated by meiotic counts except in the case of *B. juncea*. The length of the chromosomes in the *Brassica* species was found to decrease as the number of chromosomes increased.
Various stages of meiosis in *E. sativa* and the first three of the *Brassica* forms were studied except prophase, in which a critical examination was impossible owing to the small size of the chromosomes.

At diakinesis, there were 11 bivalents in *E. sativa* and 10 in the three *Brassica* forms, the distribution being uniform as it was also at interkinesis and telaphase II. At metaphase I the bivalents are arranged like floating magnets in an electric field. Both a stable and unstable form of arrangement were recorded, but the former was by far the most frequent though distorted to some extent by secondary pairing between certain bivalents. Lagging bivalents at anaphase I are regarded as being possibly due to interstitial chiasmata.
Secondary pairing occurred to a considerable extent in all four plants studied and from the number of bodies in the metaphase plate of *E. sativa* the basic chromosome number is regarded as being 6 and the haploid chromosome set may perhaps be represented as *AA BB CC DD EE F*. The three *Brassica* forms are, it is thought, probably secondarily balanced polyploids derived from crossing combined with certain structural changes. Attention is drawn to the bearing of these theories on the phylogeny of the *Cruciferae*.
Some remarks on the possible complex of forces producing separation at anaphase are also included.

1112. Alam, Z. 633.853.48:581.162.52
**Self-sterility in *Eruca sativa* Lam.**
J. Genet. 1936 : **32** : 257–76.
As a result of controlled and uncontrolled pollinations in *Eruca sativa* the occurrence of self-sterility or physiological self-incompatibility was established, differing in degree in different plants. It could be completely overcome by bud pollination two days before the flowers were due to open and to a slight extent by pollination of flowers two and three days old. Compatible matings were fully effective at any time between two days before and two days after opening.
It is suggested that self-sterility in this plant is due to an inhibiting substance or reaction which begins to operate one day before the opening of the flower, is most active on the day the flower opens and then gradually becomes less active with increasing age of the flower.
Since natural pollination, which is mainly by insects, takes place mostly on the day the flowers open and since plants from selfed seed are reduced in vigour, the phenomenon may be considered as a device to ensure cross pollination with the consequent advantage of heterosis.
All the 36 possible cross and self-pollinations with 6 plants were made and it was found that there existed completely self-sterile and self-fertile plants, with different degrees of self-sterility between them. Differences in compatibility between different cross-pollinations were also noted.
In the course of the work parthenocarpy and phenospermy (the production of empty seeds) were noted.

1113. 633.853.49:582(54)
Sabnis, T. S. and Phatak, M. G. 633.853.49:581.162.3
**A preliminary note on the classification of cultivated Indian mustards.**
Indian J. Agric. Sci. 1935 : **5** : 559–78.
*Brassica nigra* Koch, *B. rugosa* Prain, *B. juncea* H. f. and T., *B. campestris* L. and *B. napus* L. are dealt with. Descriptions of the species and their varieties are given and a key for their identification is provided. *B. juncea* is divided on the basis of hairs into two varieties *Hirsuta* and *Glabra*. *B. campestris* is divided on the basis of the habit of the fruit into *Erectisiliquosa* with erect pods and *Pronisiliquosa* with pendant pods.
Brief notes on flowering and pollination are given as an appendix.
B.P.P.

1114. Rhind, D. 633.853.74:581.143.26.035.1:575"793"
**A note on photo-periodism in sesamum.**
Indian J. Agric. Sci. 1935 : **5** : 729–36.
Experiments with the so-called " late " sesamums shewed that these are short-day forms and if they are grown under long-day conditions they tend to produce excessive vegetative growth while reproduction is suppressed or rendered abnormal. The " early " sesamums however are able to flower and fruit both under short-day and long-day conditions though doing best under the latter. B.P.P.

1115. ALLNUTT, R. B. 633.853.74–1.531.12
**The establishment and maintenance of a pure supply of white sesame seed.**
E. Afr. Agric. J. 1936 : **1** : 369–71, p. 420.
In view of the desirability of eliminating the dark seed from plantations of *S. indicum* two methods of obtaining pure white seed, by plant selection and by hand picking, are described. The latter method is regarded as less reliable than the former.
Centralized multiplication of the seed obtained by selection is recommended and measures for the maintenance of purity during and after multiplication are indicated.

1116. 633.854.797:576.312.35
GREGORY, P. J. 576.353:576.354.4
**Cytological studies in safflower (*Carthamus tinctorius* Linn.).**
Proc. Indian Acad. Sci. 1935 : **1** : Sect. B : 763–77.
A detailed study of somatic mitosis in the root tips. The somatic number of chromosomes was found to be 20 (but see also " Plant Breeding Abstracts," Vol. VI, Abst. 743).
At prophase the chromosomes were found to consist of double intertwined threads which unwound themselves prior to anaphase separation. A similar doubleness was observed at anaphase and is preserved until the next division. The author thus considers that the chromosome split occurs at the late prophase or early metaphase of the division preceding that at which separation occurs and, judging from the structure produced, it must be a spiral split.
Discussing the respective merits of the chromomere and chromonema theories of chromosome structure he points out that in heavily stained prophase material stain held in the loops between the two threads can give rise to an appearance of chromomeres. He supports the chromonema hypothesis and also considers on the basis of the present and other work, that leptotene chromosomes at meiosis are double, giving a similar explanation for the chromomeric structure observed for instance by Belling. Darlington's precocity theory of meiosis is severely criticised.

1117. SABNIS, T. S. and PHATAK, M. G. 633.854.797:582(54)
**A note on the classification of Indian safflower.**
Indian J. Agric. Sci. 1935 : **5** : 705–14.
This is a revision of the classification of Indian safflowers made by Howard, Howard and Khan in 1915. Twenty-nine new types have been added. B.P.P.

## GROUNDNUTS 634.58

1118. PATEL, J. S., JOHN, C. M. and SESHADRI, C. R. 634.58:575.11
**The inheritance of characters in the groundnut *Arachis hypogaea*.**
Proc. Indian Acad. Sci. 1936 : **3** : Sect B : 214–33.
The crossing technique in groundnuts is described ; emasculation is performed between 5 and 6 p.m. and crossing between 7 and 8 a.m. in the following morning.
In crosses between bunch and spreading varieties segregation into 15 green : 1 albino was obtained in $F_2$. No albinos were obtained in crosses between spreading varieties and in crosses between bunch varieties only in those involving the Hebbal variety H.G.1, which is derived from a cross between a spreading and a bunch variety. The constitution of the spreading varieties and H.G.1 is represented by $G_1G_1g_2g_2$, the remaining bunch varieties being $g_1g_1G_2G_2$.
Stunted, sterile plants were obtained in the $F_2$ of the crosses of Corientes–3, a Brazilian variety, with spreading varieties in the ratio of 15 normal : 1 abnormal ; Corientes–3 is therefore represented as $N_1N_1n_2n_2$ and the other parents as $n_1n_1N_2N_2$. No such plants were obtained in crosses involving the bunch varieties Small Japan and Gudiyatham Bunch, which are therefore represented as $N_1N_1N_2N_2$.
The habit of growth of bunch varieties was found to be recessive to that of spreading varieties and usually a·3 : 1 ratio was obtained in $F_2$. In the cross Spanish–10 (bunch) x H.G.1 (bunch) however, the $F_1$ was spreading and 9 spreading : 7 bunch were obtained in $F_2$, shewing that complementary factors, designated $S_1$ and $S_2$ are involved.

The production of numerous secondary and tertiary branches is a dominant character, giving 3 : 1 segregation in the $F_2$. The re-assortment of habit of growth and type of branching was not independent in a cross between a spreading, branched variety, Phillippine White and a bunch, non-branched variety Corientes–3 ; about 30 per cent crossing-over occurred between spreading and branched. Branched and non-branched are represented by *BB* and *bb* respectively.
Crosses between early and late varieties gave an intermediate $F_1$ and segregation into 1 late : 2 medium : 1 early in $F_2$, late being designated *LL* and early *ll*.
In the crosses Philippine White (sparsely hairy) x Corientes–3 (hairy) the $F_1$ was hairier than Corientes–3, while in $F_2$ different degrees of pubescence were encountered. Classification into three groups gave a segregation into 1 very hairy : 2 sparsely hairy : 1 slightly hairy, suggesting a single main factor *H* for hairiness.
Four seed coat colours were studied, white, rose, red and purple. The ratios obtained in different crosses were often capable of more than one interpretation, but the most probable explanation is as follows : white is the bottom recessive, *pprd.rd.*$r_1r_1r_2r_2$, rose is produced by either of the duplicate factors $R_1$ and $R_2$ while red and purple are produced by *Rd.* and *P* respectively but only in the presence of $R_1$ or $R_2$.
Purple pigment in the plant is also produced by duplicate factors, probably the same factors as are concerned in the production of seed coat colour, $R_1$ and $R_2$.

## VARIOUS TREE FRUITS 634.65

1119. Hofmeyr, J. D. J. 634.651:575
**Inheritance in the papaya. Progeny studies of selected parents.**
Fmg. S. Afr. 1936 : **11** : 107–09, 126.
Evidence from controlled pollinations indicates that both the staminate and pistillate parents are important in determining characters of the $F_1$ such as size, shape, and unit volume weight (weight/volume) of fruit, thickness of flesh, flavour, size and shape of seed-cavity, texture and colour of skin and so on.
More definite results in selection can therefore be obtained sooner by controlled pollination and progeny tests but, since the method is still in the experimental stage and it is not known whether continued inbreeding will lead to loss of vigour, farmers are advised to continue on the old lines (Cf. " Plant Breeding Abstracts," Vol. III, Abst. 579) for the present.

1120. 634.651:581
Caius, J. F. 634.651:581.6
**The papaw tree.**
J. Bombay Nat. Hist. Soc. 1935 : **38** : 41–60.
Having indicated the main botanical characteristics of the papayas, the species *Carica Papaya* Linn. is discussed from the standpoints of its dispersal, botanical features, hermaphroditism, domestic and medicinal uses, popular beliefs and superstitions.
The chemical properties and medicinal properties of the ferment papain and its commercial possibilities are also considered.
In discussing cultivation the various problems of variation in seedlings and the proper adjustment of the series in plantations are emphasized.
Finally a list of the vernacular names for *C. Papaya* is given.

## STRAWBERRIES 634.75

1121. Ames, J. 634.75(41)
**Strawberry varieties in Scotland.**
Scot. J. Agric. 1936 : **19** : 156–62.
Observations have been made for the past five years at Craibstone bearing on the accurate identification of commonly grown varieties (the elimination of synonyms, etc.) and on their vigour and other qualities.
The scheme of identification is on the lines of that used at Long Ashton. The botancial features used in identification are given with a key to the common varieties and a description of the chief commercial varieties in order of ripening.

## VITICULTURE 634.8

1122. 634.836.72:575(94)
634.843.09

CASTELLA, F. de 634.851.09:575.12:634.843.6

**Phylloxera-resistant vine stocks (IV.) including some recent introductions.**

J. Dep. Agric. Vict. 1936 : **34** : 89–97.

The leading features of the North American species *Vitis monticola*, *V. aestivalis*, *V. arizonica*, *V. cinerea* and *V. candicans* are outlined. Also a number of hybrid stocks in the composition of which some of the foregoing species are represented as well as *Riparia* and *Rupestris* are described. Some notes on *Vinifera* x *Rupestris* hybrids conclude this survey.

## FORESTRY 634.9

1123. 634.97:575
634.975:575.127.2

**Eleventh Annual Report of the Imperial Forestry Institute. Academic year, 1934-35.**

Imp. For. Inst. Univ. Oxf. 1935 : Pp. 34.

The work on the cricket-bat willow, elms and larch (Cf. " Plant Breeding Abstracts," Suppl. II, pages 31 and 51) has been continued. Hybrid seedlings from the cross *Larix decidua* Mill. x *L. leptolepis* Murr. have now been obtained.

## VEGETABLES 635

1124. 635.65

HOARE, A. H. 635.65:575

**Beans.**

Bull. Minist. Agric. 1936 : No. 87 : Pp. 69.

The introduction to this pamphlet deals concisely with the nomenclature, history and botany of various kinds of beans, with a short section on the known facts relating to the genetics and breeding of this crop.

1125. ADAM, D. B. 635.652–2.3–1.521.6:575.42

**" Halo blight " in French beans. A report on measures for its control.**

J. Dep. Agric. Vict. 1936 : **34** : 34–45.

In comparative variety trials of green bush beans, Pale Dun and Feltham's Prolific proved superior to Canadian Wonder in resistance to halo blight (*Phytomonas medicaginis* var. *phaseolica*) though inferior in horticultural qualities. Subsequent observations on severely infected crops of Canadian Wonder suggest the possibility of isolating resistant strains of this variety by individual plant selection.

1126. SUIT, R. F. 635.652–2.3–1.521.6:575.42

**Preliminary report on investigations of bacterial blight of beans.**

25th and 26th Rep. Quebec Soc. Prot. Pl. (1932/34) 1934 : 75–79.

Of eight varieties tested at Macdonald College in 1932 or 1933 Scotia and Tepary (*Phaseolus acutifolius* Gray variety *latifolius* Freeman) were slightly susceptible, Refugee 1000–1 moderately susceptible while the rest were susceptible to bacterial blight (*Pseudomonas phaseoli* E. F. Smith.) Selections have been made from disease-free plants of the varieties grown in 1933.

1127. NARASINGA RAO, U. 635.977:576.312.35

**Chromosome numbers in *Millingtonia hortensis*, Linn. f. (Family : *Bignoniaceae*).**

Curr. Sci. 1936 : **4** : p. 654.

The chromosome number of this ornamental tree has been determined for the first time and $2n = 30$ and $n = 15$.

# Part II. Foreign

## STATISTICS 519

1128. DRION, E. F. 519.24
**On the interpretation of frequency curves in biology.**
Rec. Trav. Bot. Néerland. 1936 : **33** : 77–132.

The necessary conditions are determined which must be satisfied by a group of plants so that the frequency curve of any characteristic of those plants may have practical value. Length of plants only was considered, and experimental data were used to determine the nature of the frequency curves, which were never Gaussian. The theory that the curve should be Gaussian is discussed, and such a supposition is shewn to be equivalent to the hypothesis that the growth rate of a plant is only determined by the external factors, and not by the previous history of the plant, an hypothesis which is certainly not true. Theories of Quetelet and Kapteyn are discussed only to be rejected. The drawbacks of Pearson's method of curve fitting are pointed out. It is determined that the method of " Student " and Fisher is not applicable generally to biological problems, since to apply this method it is necessary to know the " a priori " distribution of the " Universe." Certain experiments on length and breadth of leaves of *Robinia Pseudacacia* L. and on length and " cotyledon " breadth of *Kalanchoë verticillata* S. Elliot are described, and it is concluded from the theoretical and experimental investigation that it is impossible to determine " a priori " the form of the frequency curve of any characteristic of a group of plants. J.W.

1129. KRISTENSEN, R. K. 519.24
Om variationsanalyse. IV. (**On the analysis of variance IV.**)
Tidsskr. Planteavl. 1936 : **41** : 360–67.

In continuation of the series of articles on the analysis of the variation of observational data, the author is concerned to test the significance of the differences between the estimates of standard deviation that can be made when the total variance is analysed. For this purpose he shews how to calculate the standard error of the standard deviation estimate, and explains the use of the test. J.W.

1130. BONNIER, G. and TEDIN, O. 519.24:575.113.4
**The $F_2$– test of homomeric $F_2$– segregations.**
Hereditas, Lund 1936 : **21** : 227–39.

A statistical method is developed for finding the most likely number of factors concerned in a given example of homomeric segregation from the data of the $F_3$ families.
The method of applying a test of goodness of fit of the data to the hypothesis thus deduced is also derived, using the crossing method.
These are illustrated by an example.

## PHYSICS 53

1131. PIROVANO, A. 538.6:575.242
L'électro-génétique. (**Electro-genetics**).
Rev. Hort. Paris 1936 : **108** : 119–24.

The effect of electro-magnetic treatment used by the author is discussed and the resultant mutations obtained from such plants as maize, hemp, cucurbits, chicory and grapes are briefly described.

## GENETICS 575

1132. VAVILOV, N. 575:633
Les bases botaniques et géographiques de la sélection. (**The botanical and geographical basis of selection**).
Rev. Bot. Appl. 1936 : **16** : 124–29 ; 214–23 ; 285–93.

A French translation of the first chapter of Vavilov's work reviewed in " Plant Breeding Abstracts," Vol. VI, p. 327.

1133. Husfeld, B. 575:633(43)
Aufgaben der Pflanzenzüchtung. (**The tasks of plant breeding**).
Mitt. Landw. 1934 : **49** : p. 626.
In outlining the tasks of German plant breeders and breeding firms the greatest emphasis is laid on the breeding of those products for which Germany is dependent upon import from abroad. Thus the breeding of sources of protein, such as the sweet lupins, and high-protein barleys, fodder plants and potatoes takes first place. Then follows the breeding of oil plants such as soya bean and other possible sources of vegetable oil. The increase of plant yield is also of great importance and can be achieved by direct breeding and by breeding for resistance to pests and diseases and to unfavourable growth conditions. Other valuable directions of German plant breeding mentioned are the production of nicotine-free tobacco, and of lodging-resistant and early maturing varieties of a number of crops, the extension of the bearing season of the main fruits and vegetables, and the improvement of timber trees by increasing their yield, vigour of growth and resistance to various diseases.

1134. Krohn. 575:633(43)
Neuaufbau der deutschen Pflanzenzucht. (**Reorganization of German plant breeding**).
Mitt. Landw. 1934 : **49** : p. 600.
The author ascribes the crisis in the German seed production trade partly to the plethora of varieties resulting from the excessive individualism of the seed producing firms—28 different forms of von Lochow's oats were, for instance, being offered for sale. A special body, the Seed Union (" Reichsverband der deutschen Pflanzenzuchtbetriebe "), was inaugurated to aid the state in dealing with this situation, and to limit the number of varieties marketable. By combining synonymous varieties from different firms it has already been possible to suppress 331 " varieties " and in the near future 500 further varieties, which offer no advantage over other existing varieties, will be withdrawn. This body will also circularise its members as to developments in other parts of Germany and abroad and in future certification will be granted only to varieties embodying some definite superiority to those already existing, in which respect varieties from abroad will be given equal chances of certification to those produced in Germany. The control of the seed production is another important task of the Seed Union.
Some of the main directions in which improvement is expected from breeding in the different German crops are enumerated.

1135. Mahner. 575:633(43.7)
Professor Freudl als Förderer und Organisator der heimischen Landwirtschaft. (**Professor Freudl as the promoter and organizer of our native agriculture.**)
Bl. PflBau. PflZücht. 1936 : **13** : 55–58.
An appreciation of Professor Freudl's twenty-five years work for agriculture and plant breeding in Czechoslovakia.

1136. Hudson, P. S. 575:633:061.6(42.59)
**The Imperial Bureau of Plant Genetics.**
I.I.D. Commun. 1936 : **3** : Fasc. 2 : Hu. 1–8.
On the functions and activities of the Imperial Bureau as a clearing house for information on plant genetics.

1137. Flovik,K. 575:633:576.312
Planteforedling på cytologisk basis. (**Plant breeding on a cytological basis**).
Tidsskr. Norske Landbr. 1936 : **43** : 71–75.
Vik, K.
Cytologi og planteforedling. (**Cytology and plant breeding**).
Tidsskr. Norske Landbr. 1936 : **43** : 128–31.
The above two papers contain a further defence of Flovik's position, and Vik's final comments in this discussion (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 436).

1138. SENGBUSCH, R. v. 575:633:578.08
Ein Problem der Züchtungsforschung. Analyse und Synthese komplexer Eigenschaften. (**A problem in research in breeding. The analysis and synthesis of complex characters**).
Forsch. Fortschr. dtsch. Wiss. 1935 : **11** : 427–29.
The methods of work and the degree of success achieved in breeding for desirable characteristics such as non-splitting of the pods and freedom from alkaloids in lupins, non-bursting of the fruits in tomatoes, chlorosis resistance of lupins, etc. are surveyed. The necessity is emphasized for combining various methods of attack in the problems that arise in breeding for complex characters determined by more than one gene, e.g., frost or drought resistance, storage capacity, flavour, and the necessity for recognizing the importance of the roles of physiology, morphology, chemistry, meteorology, geology and mathematics, etc. in such genetic research is made clear.

1139. 575:633:581.192
BELMONTE, J. 633.11:664.641.016
Problemas químicos de la genética vegetal. (**Chemical problems of the plant geneticist**).
Arch. Fitotécn. Uruguay 1935 : **1** : 203–23.
The technique and various problems of determining the chemical composition of vegetable products such as cereal grains and flour are discussed, special mention being made of the methods recently evolved for determining the baking quality in small samples for purposes of breeding. A comprehensive bibliography is appended.

1140. BROWN, H. D. 575:635(77.1)
**Vegetable plant breeding program for Ohio.**
Proc. 21st Annu. Mtg. Ohio Veg. Gr. Ass. 1936 : 61–62.
Brief descriptions are given of the aims of breeding work being carried out in Ohio with cabbage, beet, lettuce, tomato, sweet corn, musk melon and onions.

1141. 575.1:00.14
BRASCHI, B. 575.42
Appunti di genetica vegetale. (**Notes on plant genetics**).
L'ortofruttic. Italiana 1936 : **5** : 17–18.
The author suggests new definitions for the terms variety (varietà), race (razza) and strain (stirpe) and notes the importance of selection for obtaining new forms of plants.

1142. BODEWIG, E. 575.1:519.2
Mathematische Untersuchungen zum Mendelismus. (**Mathematical investigations on Mendelism**).
Z. indukt. Abstamm. -u. VererbLehre 1936 : **71** : 84–119.
Mathematical studies on the distribution of genes and phenotypes in natural populations, with special reference to eugenical problems. Different complications such as polymery and sex-linked inheritance are considered.

1143. BODEWIG, E. 575.1:519.2
Mathematische Untersuchungen zum Mendelismus und zur Eugenik. (**Mathematical investigations on Mendelism and eugenics**).
Genetica 1936 : **18** : 116–86.
The first part of this paper is the same as that reviewed in Abst. 1142 above. The second part deals with eugenical problems.

1144. 575.125:633.35:575.127.2
575.125:576.356.2

SWESHNIKOWA, I. N.

(**A cytogenetic study of heterosis in hybrids of *Vicia*).**

Biologičeskii Ž. (J. de Biol.) 1935 : **4** : 843–54.

The various species comprising the conspecies *Vicia sativa*, namely *V. amphicarpa*, *V. sativa* and *V. angustifolia* and their respective subspecies are distinguished by characteristic chromosome differences, which are described. The morphological characteristics distinguishing the various species and races are also described and tabulated. Numerous crosses were made between the various representatives and about 500 $F_1$ plants of different combinations were examined. All $F_1$ hybrids displayed marked heterosis.

*V. angustifolia* is a very polymorphic species. One line with a longer A chromosome than the normal is referred to as var. *dolichosomica* ; it is distinguished from the normal (*brachisomica*) by narrow, black pods and unusually small seeds. These two varieties when crossed produced partially sterile hybrids. The plants were half as big again as the normal, this being ascribed to the combination of the height factors $P_1P_1$ from *brachisomica* with those from *dolichosomica* $P_4P_4$. Another distinct form, race B, which is expected also to differ in chromosome morphology, was characterized by unusually long and narrow leaves, thick stem and unifloral inflorescences. When crossed with *dolichosomica* this variety gave dwarf plants only a few centimetres high. Eight such plants were obtained, one gave two seeds, the others being entirely sterile and some did not even flower. They had the normal diploid chromosome number 2n=12. This phenomenon is called negative or " minus-heterosis." It is explained either by an unfavourable combination of genes, $P_2P_2$ from race B and $P_4P_4$ from *dolichosomica* or by the presence in race B of a growth inhibitor *DD* whose action is suppressed by a gene *KK*. If both these genes were absent in *dolichosomica* the hybrid *DdKk* would shew the inhibition of growth. The fact that in certain combinations of *dolichosomica* with *brachisomica* marked heterosis occurs, and in others dwarfness, is taken as a strong support of the factorial interpretation of heterosis.

Marked heterosis was also observed in the crosses of *V. sativa* with *V. angustifolia brachisomica* and *V. sativa* x *V. a. dolichosomica*. This is again accounted for by the combination of polymeric factors of the three dominant genes for branching at the base ($M_1M_1M_2M_2M_3M_3$) from *V. angustifolia* and for height ($P_1P_1P_2P_2P_3P_3$) and branching along the stem ($H_1H_1H_2H_2$) from *V. sativa*. The species with the greatest size were seen to be those in which chromosomes A and F were longer and the dominance of the general habit and more especially the amount of branching was most pronounced in the crosses of these species, so that these were the crosses displaying the most heterosis. This phenomenon is explained by translocation, involving a chromosome segment containing a number of the multiple growth factors.

In the second generation of the cross *V. sativa* x *V. a. dolichosomica* 6 per cent. of the plants were colourless and died in the early stages. In one quarter of the plants the tips of the leaves began to wither after about a fortnight and the plants were yellowish all through life, though some of them flowered. Three striped chimaeras of albino and normal were also observed. This segregation is interpreted on a two factor basis for the presence of chlorophyll.

The cross *V. sativa* x *V. a. brachisomica* gave an $F_2$ consisting of vigorous plants, some of them exceeding the $F_1$ in vigour and combining the most favourable growth factors of all the sepcies, such as large, firm, upright stems with vigorous branching both in the lower part of the stem and in the leaf axils, tender leaves and stems with strong vegetative development. One plant 1·25 m. high occurred. It is thought possible that this plant may be a trisomic for the F chromosome, previously shewn to carry the factors for branching. Thus just as the minus-heterosis only occurred in certain crosses the most favourable effects also only occur in certain definite combinations of crosses. A large-scale hybridization of these two species is recommended with the object of producing constant forms of the type exhibiting maximum heterosis.

1145. HALDANE, J. B. S. 575.17

Contribution de la génétique à la solution de quelques problèmes physiologiques. (**The contribution of genetics to the solution of some physiological problems**).

C.R. Soc. Biol. Paris 1935 : **119** : 1481–96.

The results of experiments on the action of genes controlling physiological phenomena shew that genetics is not to be limited to the study of heredity and variation but has a valuable contribution to make towards the elucidation of physiological problems.

Examples are quoted for both plants and animals which shew that though the final expression may be such an apparently simple one as, for example, a colour or the lack of it, yet the gene or genes in question control part of a complicated physiological and chemical process which leads to the colour change. Experiments with material lacking certain of the genes will therefore help towards a more complete knowledge of the reaction involved.
Finally the author makes some admittedly speculative suggestions as to the value of a gene.

1146. KOLTZOFF, N. 575.17
**(The role of the gene in the physiology of development).**
Biologičeskii Ž. (J. de Biol.) 1935 : **4** : 753–74.
The author reviews the very most recent developments on chromosome morphology and the nature of the gene. The view is expressed that the basic structure of the chromosome, referred to as the "genonema," consists not of a series of molecules but of one large molecule. Analogous cases are quoted to shew that this is not impossible. The different molecular complexes constituting this composite molecule are possibly identifiable with the genes. In support of this view cases are quoted where a definite chemical compound, whose structure is known, may be entirely absent from an organism, in which case its formation by the organism is permanently impossible, though when minute quantities are introduced their further building up is continued. The specific nature of certain bodies whose presence is inherited is illustrated by reference to the four blood types and the haemoglobin nucleus is thought to form part of the genomena molecule. Similarly, without the presence of the crystalline skeleton of chlorophyll no chlorophyll can be formed and it is probable that this skeleton is transferred as such from generation to generation and the same applies to anthocyanins and other pigments.
Another example given is that of the vitamins, the presence of minute quantities of which make certain reactions possible.
When the crystalline bases of a particular substance are present in the genomena their further synthesis is possible without further difficulty and when a certain amount is manufactured the genomena automatically divides. This accounts for the splitting of the chromosomes in their characteristic manner.
Numerous illustrations, biochemical and botanical, of the occurrence of processes of this kind are given, including the case of the uninuclear organism *Acetabularia*, where, according to Hemmerling, when a portion of one species without a nucleus is grafted on to the base of another species containing a nucleus it retains its characteristic type of growth but if the top be removed it grows again in the form characteristic of the species whose nucleus is present. The substances determining the type of growth evidently diffuse out of the resting nucleus.
In addition to the type of gene which transfers the basis of a substance bodily from generation to generation there is envisaged another type which does not participate in the end product of a reaction but only influences it as a catalyst, in which its role may be replaced by another catalyst with a similar action. These are classed as modifying genes and cases are cited in which the action of particular genes has been exactly imitated by the direct action of X-rays or other reagents in doses too low to alter the genotype.

1147. MATSUURA, H. 575.17:576.312.3
**[The chromomere and its critique. (A preliminary note).]**
Jap. J. Genet. 1936 : **12** : 38–40.
In this discussion of the chromomere and the chromonema theories, the impossibility of reconciling them is pointed out.
The author's observations on division in pollen mother cells of *Trillium kamschaticum* gave no support to the chromomere hypothesis and he also interprets in a similar way data presented by other workers as evidence of the existence of chromomeres.

1148. MATSUURA, H. 575.22:575.12:576.16
**The theory of genotypic parallelism as a basis of group-variability.**
J. Fac. Sci. Hokkaido Univ. 1935 : Ser. V : **3** : 139–67.
An attempt to present a general survey of the problem of whether it is justifiable to consider varietal, specific, generic, etc. characters under one category and if so to what extent this is permissible.

Utilizing the data already assembled in his monograph on genic analysis and also from other sources, Mendelian segregation in interspecific crosses is examined and the findings are shewn to imply that the taxonomists' " essential" species characters are subject to the same principles of segregation as the varietal characters.
In considering the problem of phenotypic and genotypic parallelism it is shewn that without data from diallel crosses in the analysis of parallel variations definite proof of the identity of genes in interspecific crosses is lacking ; such identity may however be presumed *a priori* to exist since in any species crossing freely *inter se* Mendelian segregation will result in the production of parallel variations.
Evidence on the occurrence of duplicate and triplicate genes and on segregation of numerous characters in cotton, wheat and other plants is adduced to shew that the genotypic parallelism in variability in polyploids is a natural consequence of their nature as polyploids. Moreover the differences between the diploid and tetraploid or between tetraploids and hexaploids are a matter of degree rather than of kind.
Interspecific sterility is not regarded as a reliable criterion of far reaching genotypic dissimilarity and it may even be due to a different arrangement of identical genes in morphologically similar chromosomes (e.g. in *Drosophila* species).
Dissimilarity in the genetic behaviour of parallel variations in different species is explained by reference to cases of reversal of dominance, which is shewn to be capable of interpretation on the same basis as the results obtained from intra- and interspecific crosses, and true homology may exist. The effects of plasmatic and other environmental factors must also be considered in cases of dominance reversal.
That regularity of genotypic variation is also exhibited in different genera of the same family is suggested by a comparison of the genetic analyses of *Oryza* and *Zea*.
It is concluded that even distantly related species may have in common a large proportion of their germinal constitution and organization and from this common basis genotypic parallel variations may result. All the evidence so far available indicates that inter- and intra-specific crosses differ rather in degree than in kind. Taxonomic categories are without phylogenetic significance and specific, generic and family characters should not be regarded as pertaining each solely to its particular category ; they are characters composing the various species and—differing only in the extent to which they are possessed in common by the various organisms—should all be subject to the same laws of genetic behaviour.

1149. Vavilov, N. I. 575.24
**(Hugo de Vries).**
Priroda (Nature) 1936 : No. 1 : 119–30.
An obituary notice, containing a rather full account of the life and work of the famous botanist

1150. 575.24:575.3
Olenov, Ju. M. 632.422.3:575.242:577.15
**(Mutations and the problem of adaptation).**
Priroda (Nature) 1936 : No 1 : 32-38.
Reference is made to cases in *Drosophila*, observed by Timoféeff-Ressovsky and others of mutants in which the survival value is greater than in the normal form in some cases under special conditions only, e.g. higher temperature, etc. etc. Similar cases have been observed in the *Saccharomycetes* and other fungi. The author also refers to his own experiments on X-ray treatment of certain races of the yeast *Zygosaccharomyces mandshuricus* in which some of the new races obtained after irradiation were capable of fermenting sugars (e.g. maltose) upon which the original form had no effect. When grown in mixed culture with the original race in a beer must, containing a large proportion of maltose, the new race rapidly developed at the expense of the original race, which gradually died out.
The evolutionary significance of these results is pointed out, in relation to the production of mutants having a higher adaptational value than the original race.

1151. 575.24:581.01
576.312.36:576.16
633.14:575.243

NAVASHIN, M. and GERASSIMOVA, H. N.

**(Nature and causes of mutations. I. On the nature and importance of chromosomal mutations taking place in resting plant-embryos due to their aging).**

Biologičeskii Ž. (J. de Biol.) 1935 : **4** : 593–634.

A somewhat fuller account is given of the observations previously referred to (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 445), together with a quantity of new data, on the aberrant plants obtained from aged seeds of various species of *Crepis* and *Secale cereale*. The effect in rye begins sometimes after the seeds have been kept only for 2–3 years. One of the characteristics of the plants from aged seeds is the presence of small granules of chromatin in the first-formed cells of the young seedling. These are fragments of chromosomes and are accompanied frequently by larger fragments, all of which however are mainly absent in the cells of the later tissues of the plants, having been lost in cell division. As a result of the loss of chromosome material some of the cells die altogether. Many plants appeared normal until the time of flowering, when they proved to a greater or lesser extent sterile. The proportion of mutant plants varied but in one lot from eight-year old seeds it reached 43·8 per cent. A large proportion of the mutant plants consisted of chimaeras of mutant and normal tissue.

The sterility of the mutant plants was dependent usually on various kinds of dislocations (translocations, inversions, etc.) that had occurred in the chromosomes, rarely also inversions. No reduction in chromosome number was ever observed, nor a break in the immediate vicinity of the attachment constriction. In all cases the longer arms of the chromosomes were more frequently involved than the short arms.

Various considerations shew that the mutations are not caused by external agencies such as radiation : e.g. the rapid rise in proportion of mutations from almost nil in the first few years to nearly 100 per cent after a few years have elapsed. The amount of natural radiation is moreover insufficient to account for the number of mutations observed. The mutations are apparently caused by some internal process in the cell, as is shewn by the increase in the rate of mutation by raising the temperature or water content, and in this connexion it is pointed out that the resting seeds are the only cells in which the chromatin remains for an extended period without being continually renewed by mitosis. Grounds are given for believing that the changes occur in the chromosomes while in the " resting " condition, which accounts for the fact that they are changed only in form but not in number. All the translocations in which the chromosomes could be recognised visually proved to be reciprocal, and certain cases were observed where the position of the attachment constriction was changed as a result of inversion. No fragment without an attachment constriction ever acquired one and such fragments invariably were ultimately lost. Many of the dislocated chromosomes were viable however, and new constant races were formed in this way.

In the light of the changes in chromosome length and structure observed in these experiments the author concludes that it is dangerous to make inferences as to the homology or evolution of chromosomes merely on the grounds of their morphology. On the other hand the dislocations are of importance from an evolutionary point of view on account of the sterility barrier between them and the original parents, in consequence of which they provide material for the evolution of new independent lines. Cases even occurred, though extremely rarely, in which the chromosome number was changed by translocation, firstly when the whole material of one chromosome was translocated on to another chromosome, the spindle fibre being lost, thus reducing the chromosome number without loss of chromatin ; the second way was by the loss of most of the chromatin of a trisomic chromosome, some of the chromatin from another chromosome being then transferred on to the spindle fibre, so increasing the chromosome number by one. Both cases are naturally very rare but afford instances of how the chromosome number may change in evolution.

By these experiments mutation is shewn to be as natural a part of the reproductive process as heredity itself, a fact which has not been recognized previously simply because only fresh seeds not subjected to any special treatment have usually been used for genetic experiments. Various

common agricultural operations are referred to which favour mutation and have probably contributed towards variation in cultivated plants and even in nature it is probably not infrequent for seeds to be subjected to influences, such as undue periods of dormancy, abnormal temperatures or humidity, etc. which tend to increase the mutation rate.
The authors are inclined to think that factorial mutations and chromosomal mutations arise in the same way and are subject to the same laws.

1152. 575.24:581.01
GERASSIMOVA, H. N. 575.243:576.312.36
**(Nature and causes of mutations. II. Inheritance of mutations caused by aging of seeds : occurrence of "homozygous" dislocants in the progeny of plants grown from old seeds).**
Biologičeskii Ž. (J. de Biol.) 1935 : **4** : 635–42.
The original Russian version of the article reviewed in "Plant Breeding Abstracts," Vol. VI, Abst. 774.

1153. KIRNOSSOWA, L. J. 575.24:581.036.1
**(The influence of high temperature on the mutation process in seeds of *Crepis tectorum* L. at constant humidity).**
Biologičeskii Ž. (J. de Biol.) 1935 : **4** : 1033–40.
Seeds were maintained for 8 and 10 hours in chambers at 35, 40, 45, 50 and 55° C., all with an identical water content of 60 per cent. The plants issuing from the seeds treated at 35° were in every way normal, certain of the 40° plants shewed signs of growth anomalies, and these were increasingly pronounced in the treatments at the higher temperatures.
Chromosome irregularities were observed in many of the plants both of normal and abnormal external appearance, consisting entirely of either translocations or inversions, all four chromosomes being involved. These chromosome mutants were even observed in the plants receiving the lowest dosage, i.e. 35°C. for 8 hours, where 3·8 per cent chromosome mutants appeared. Their number was greater in the higher doses but the highest of all contained a lower proportion again, probably owing to a greater degree of lethality.
It is seen that the results are entirely similar to those from aging of the seeds, the only effect of high temperature being to bring about a great increase in the rate of the reaction. In agricultural practice it is not infrequent for seeds to be subjected to such temperatures as these or even higher, which may thus be a common source of mutation in agricultural plants.

1154. IMAI, Y. 575.242.061.633:581.174
**Chlorophyll variegations due to mutable genes and plastids.**
Z. indukt. Abstamm. -u. VererbLehre 1936 : **71** : 61–83.
The origin of white-striped plants of barley is held to be due to an exo-mutation of the plastids (see "Plant Breeding Abstracts," Vol. V, Abst. 707). Variation in the chlorophyll content of *Pharbitis Nil* is caused by mutable genes. Analogous cases occurring in the Pteridophyta, Gymnosperms and Angiosperms are briefly noted.
A discussion of cases of Mendelian variegation is reserved for a future occasion. The author's conception of the mechanism of mutable genes and plastids is discussed.

1155. MELLE, V. 575.247:575:633
Mutations somatiques. Leur valeur et leur rôle dans l'amélioration des plantes.
**(Somatic mutations. Their value and their role in plant improvement).**
Rev. Bot. Appl. 1936 : **16** : 97–104 ; 193–207.
A comprehensive paper in which the various types of mutations and the underlying chromosome changes, cytoplasmic variations, chimaeras and the formation of new varieties by somatic mutation are described, with a discussion of the findings of the numerous well-known workers on these subjects.
There is a bibliography of 43 papers most of which have been abstracted in "Plant Breeding Abstracts."

1156. 575.257
575.255
WINKLER, H.
**Chimaeras and burdons.**
Res. and Progr. 1936 : **2** : 108–12.
A brief account in English of the author's work in this field (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 447). A periclinal chimaera has now been obtained in which the two outer layers of the growing point are burdo in nature ; this includes the layer which forms the germ cells and so it is hoped to obtain information on the sexually reproduced progeny of a burdo.

1157. KIRPICHNIKOV, V. 575.41:575.3
**[The role of the non-hereditary variability in the process of natural selection. (An hypothesis of indirect selection).]**
Biologičeskii Ż. (J. de Biol.) 1935 : **4** : 775–801.
Examples are given of the parallelism existing between non-hereditary modifications produced in response to environment and characters associated with certain types and known to be hereditary. This is partly explained by the fact that individuals with the maximum adaptability in a given direction are preserved in the course of natural selection, a process which is illustrated *inter alia*, by two fields of wheat, one growing in a moist and the other in a dry field. Their habit will be quite different and in the course of years those genotypes which react most in the respective directions will survive in each field. Together with the obvious morphological features changes occur in a number of internal and other properties which influence the survival value in the changed environment. If therefore after a period of natural selection the plants are returned to the original conditions from which they were taken there is every probability that their behaviour will not return to the normal behaviour they previously exhibited. Thus even if the altered habit resulting from changed environmental conditions is not inherited other characters will have suffered a hereditary change, which is therefore referred to as an indirect effect of selection. This hereditary change will naturally be in the direction of greater adaptation and so it frequently occurs that the non-hereditary adaptational changes are accompanied in the course of generations by hereditary changes in the same direction.

## EVOLUTION 576.12

1158. STERN, C. 576.12:575.127.2:581.162.5
**Interspecific sterility.**
Amer. Nat. 1936 : **70** : 123–42.
In general terms, interspecific sterility consists in the inability of hybrid zygotes to develop normally and may result in the early death of the $F_1$ hybrid itself or prevent the formation of normal reproductive cells. Simple genetic changes or structural changes in chromosomes can in certain cases produce sterility but they cannot produce the result typical for interspecific sterility, namely, the production of inviable or zygotically sterile hybrids from homozygous fertile parents. It follows that the genetical causes of interspecific sterility are complex and its evolutionary origin involves more than a single step ; hence it is a result, a by-product, rather than a basis of evolution.

1159. EAST, E. M. 576.12:575.2
**Genetic aspects of certain problems of evolution.**
Amer. Nat. 1936 : **70** : 143–58.
A discussion of the genetical nature of the variations forming the basis of evolution.
The author concludes that chromosomal alterations such as structural changes and polyploidy are not of primary importance in this respect, nor are the types of gene mutations studied in ordinary genetical work. Thus from general considerations he arrives at a similar conclusion to that reached in an earlier paper (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 446).

1160. Longley, W. H. 576.12:576.16
**Species studies and the species problem.**
Amer. Nat. 1936 : **70** : 97–109.
Studies on species themselves and on their relations to one another in space and time shew that they are natural populations for the most part clearly distinct from one another, and that they have evolved, hereditary variation and natural selection being factors in the process of evolution. The laws of growth of simple and compound populations can be expressed in a form like the laws relating to gases or solutions. By similar analogy the laws of geographic distribution and evolution might be explained as aspects of one law applying to kinetic systems.

## ORIGIN OF SPECIES, ETC. 576.16

1161. Nabours, R. K. 576.16:575
**Species from the genetic standpoint.**
Amer. Nat. 1936 : **70** : 191–92.
It is suggested that the experimental production of species that will not cross with the progenies of the common ancestor or, if so, produce only sterile hybrids has been achieved by several workers and that the consistent accomplishment of this feat over a wide range of plants and animals will shew the effectiveness of genetics in the study of evolutionary problems.

1162. Sirks, M. J. 576.16:575.1:576.312
Het genetische soortsbegrip. (**The genetical concept of the species**).
Vakbl. Biol. 1935 : **16** : p. 199.
The important contribution that cytology has made to the species concept is referred to ; chromosome number and morphology are now the first considerations to which attention is given in assessing a species. Only plants with similar chromosome number and form, and which give complete pairing and regular meiosis on crossing, are included in the same species. In the light of this, autopolyploids and amphidiploids are both regarded as independent species, distinct from those from which they originated. Cytoplasmic differences also exist, as in the case of *Vicia Faba major* and *minor*, identical in chromosomes but different in cytoplasm ; this divides the species up into two subspecies. Next comes the question of the status of anorthoploid, aneuploid and other irregular forms which frequently occur by hybridization, etc. and are found also in nature, though less frequently because of their sterility. The author favours the limitation of the status of species to balanced chromosome types, whilst designating the unbalanced forms as hybrids. Many vegetatively propagated cultivated plants and also a number of apomictic wild plants such as the *Hieracium*, *Rosa* and other series, would thus come into this latter group being really " clones " of a hybrid form.

## CYTOLOGY 576.3

1163. Müntzing, A. 576.356.5:576.12
**The evolutionary significance of autopolyploidy.**
Hereditas, Lund 1936 : **21** : 263–378.
An extensive survey of the literature concerning intraspecific or closely related interspecific polyploid races.
Similar morphological and physiological differences are found in such races to those observed in experimentally produced autopolyploids. Moreover meiosis in the naturally occurring types usually shews the characteristic features of meiosis in autopolyploids. An important difference between experimental and naturally occurring autoploids is the greater fertility of the latter, which the author ascribes to the workings of natural selection. In the main however, the examples

studied can be considered as more auto- than allopolyploid, though the distinction between the two types is not easily drawn.
The morphological and physiological properties of autopolyploids lead to different ecological properties and so to a different distribution from the diploid. In general the polyploids are hardier and have a more northerly or more alpine distribution. There also seems to be a close connexion between high chromosome number and a perennial habit. Moreover the autoploid forms are physiologically isolated from the diploids by a barrier of incompatibility, and are able to maintain themselves with a fair degree of constancy. Thus purely quantitative chromosome changes hold great possibilities from an evolutionary point of view.
Apart from its direct effects, which have been noted in apomictic as well as in amphimictic forms, autopolyploidy has important secondary effects, e.g. aneuploidy and the production of new base numbers.
In comparing allopolyploids with autopolyploids the author stresses their similarities rather than their differences and points out that even in pronounced allopolyploids, e.g. those arising from intergeneric crosses there must be a considerable degree of autopolyploidy as the different genoms concerned must have a great deal in common.
In general the conclusion is reached that purely quantitative chromosome alterations, quite apart from structural or qualitative changes, have played an important part in the evolution of the higher plants.

1164. 576.356.5:632.111–1.521.6:635.64
SCHLÖSSER, L.-A. 576.356.5:632.111–1.521.6:633.426
Frosthärte und Polyploidie. (**Frost resistance and polyploidy**).
Züchter 1936 : **8** : 75–80.

Experiments were made on 2n and 4n forms of *Lycopersicum racemigerum* and 2n, 3n and 4n forms of a wild South American tomato *L. cerasiforme*, the 4n forms having been produced by decapitation from the corresponding diploid and the 3n by crossing between the two. Tetraploid plants of winter rape produced by the action of low temperature at the time of the reduction division were also used ; by this method 8–13 per cent 4n plants were obtained. The respective chromosome numbers were in the tomatoes 2n = 24, 3n = 36 and 4n = 48 and in rape 2n = 40 and 4n = 80. Certain hypo- and hyper-tetraploids also occurred in the rape and could be distinguished by various growth anomalies.
The 4n rape plants were very much larger than the normals and the osmotic pressure in the leaves was found to be considerably lower. The plants, which were grown in the greenhouse, were subjected to intermittent low temperatures for ten days before the flowering stage, by which means they were induced to flower in the greenhouse or in the field, though without such treatment no flowering occurred in either. In the beginning of May a very cold period set in, with night frosts of −4°C. This caused the leaves of the plants in the field to turn gradually red, which occurred however to a very much lesser extent in the tetraploid than in the diploid plants, affecting only the inner leaves of the rosette. It was seen later that the outer leaves of these plants were completely frozen, while all leaves of the diploids remained alive and the anthocyanin gradually disappeared. Osmotic measurements repeated at this time shewed that the diploid plants had increased markedly in osmotic pressure, whilst only a slight increase had occurred in the tetraploids.
The various tomato plants were planted out at the same time as the rape and all suffered severely from the frost. Here again however the tetraploids were damaged more than the corresponding diploids, which in the case of *L. cerasiforme* suffered very little whilst all the tetraploids were entirely destroyed. The osmotic pressure of the 4n plants was again little more than half that of the normals, and the osmotic pressure of the hardier *L. cerasiforme* was also higher than that of the *L. racemigerum*.
It is pointed out therefore that the loss in hardiness may often overshadow the advantage from increased yield resulting from the production of artificial polyploids in cultivated plants.

1165. 581.035:581.142
581.143.26.03
581.162
577.84

BURKHOLDER, P. R.,
**The rôle of light in the life of plants. I. Light and physiological processes.**
Bot. Rev. 1936 : **2** : 1–52.
BURKHOLDER, P. R.
**The rôle of light in the life of plants. II. The influence of light upon growth and differentiation.**
Bot. Rev. 1936 : **2** : 97–172.

In this survey of the literature covering numerous aspects of the subject points of interest to the plant breeder may be found under the sections dealing with photoperiodic stimulation (including vernalization) seed germination, reproduction, sex reversal and rejuvenation.
A bibliography of 600 references is appended.

1166. TATARINTZEFF, A. S. 581.331.23:578.6
**(A method of studying pollen germination on the stigma in practical pollination).**
Naučnoe Plodovodstvo (Scientific Fruit Growing. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1935 : No. 6 : 45–49.

A description is given of the method of examining the germination of the pollen grains in the style microscopically, by coloration with methylene blue, for purposes of testing the viability of the pollen, the compatibility of certain combinations of parents, etc.

## FIELD TESTS 631.421

1167. ARTEMOVA, P. K. and POVOLOTSKOI, E. E. (Editors) 631.421
**(Varietal testing in the main agricultural crops. Part I. Main principles and methods of judging varieties in competitive variety tests. Part II. General methods and technique of variety tests.).**
Lenin Acad. Agric. Sci., Inst. Pl. Ind., Var. Testing Service 1935 : Part I. Pp. 101. Part II. Pp. 106.

The organization of the Soviet system of variety tests is described in the first part, together with a full review of the principles upon which these trials are based. The statistical treatment of the results and the testing of special features such as winter-hardiness, disease and drought resistance, earliness, lodging and shedding etc., etc. are also described.
In the second part the necessity for uniformity in variety tests is emphasized and full instructions are given for their organization and carrying out ; the choice and preparation of the ground, the size and number of replications, the sowing and treatment of the seeds, including vernalization etc., the observations made on the growing plants, the harvesting and the study of the quality of the yield are all considered in some detail.

1168. LOVE, H. H. 631.421:519.24
**Are uniformity trials useful ?**
J. Amer. Soc. Agron. 1936 : **28** : 234–45.

An example is given to show how the results of a preliminary uniformity trial may be used, by applying an analysis of covariance, to increase the precision of a field experiment.
Different methods developed by other workers are also mentioned and the value of uniformity trials in general is discussed. With perennial crops such as tea, rubber, orchards, and so on the gain in precision is likely to be greater than with annual crops. More data are needed before the value with annual crops can be estimated but it appears that they should at least be of aid in improving the plan of the experiment.

1169. Pope, O. A. 631.421:519.24:633.51
**Efficiency of single and double restrictions in randomized field trials with cotton when treated by the analysis of variance.**
Bull. Ark. Agric. Exp. Sta. 1936. No. 326 : Pp. 28.

An analysis of a large number of field tests with cotton was undertaken in order to study the practical efficiency of restrictions applied to randomized method of lay-out in order to cope with possible variations in soil fertility. The number of replications was 6 and 8, while the number of varieties used ranged from 6 to 40. Thus the field arrangements considered were 6 x 6 and 8 x 8 Latin squares, and also " doubly-restricted randomized field arrangements " of the type variously called in this country " equalized random blocks " or " semi-Latin squares." In each case the analysis was carried through for a number of variables. Definite evidence was obtained that, in general, a significant increase in efficiency and accuracy may be expected from restricted arrangements of field tests. The efficiency was usually greater for doubly-restricted than for singly restricted arrangements, and was greatest in the case of yield and acre value, where an increase of 100 to over 400 per cent in the number of unrestricted replications would have been required to give comparable accuracy. It is concluded that the practice of laying out experimental blocks in an orderly arrangement, utilizing all the available area without giving careful consideration to the presence and orientation of fertility gradients, is highly efficient unless the total experimental area has an unusual degree of soil uniformity. J.W.

1170. Vavilov, N. I. 631.424.4:551.563
**(The world experiment of the agricultural conquest of highlands).**
Priroda (Nature) 1936 : No. 2 : 74–83.

It is shewn that all the seats of the most ancient agricultural systems are in high mountain zones in the old or new world tropics or subtropics. Here all the main economic plants and animals have been domesticated or have arisen under cultivation. The characteristics of the main centres of these primitive agricultural systems are described, with indications of the plants and animals that each has produced. These are quite different in type for each centre, since the ecological conditions of each centre where they have evolved are distinct. The geographical isolation often leads to the formation by inbreeding or mutation of characteristic populations containing unusual types in certain confined areas, such types being often genetically recessive—witness the liguleless wheats and ryes in certain islands, the large eared, large grained naked barleys of Daghestan and certain neighbouring countries and the extremely early types of most of the mountainous zones. Many others of these recessive characters are highly valuable agriculturally, e.g. the six-rowed barleys of Pamir and Tibet, and the rapid growth in the early stages of many of these barleys gives them the capacity to escape the attack of frit fly ; again, the Abyssinian barleys are exceedingly large in the grain, some of the potatoes of Bolivia and Peru unusually large in the tuber, being more than twice the size of the common European potatoes, the rye from Tajikistan has remarkably large ears, stamens and grain, also twice the normal size. Some of the Abyssinian legumes are so good that they have been introduced directly into cultivation. The Pamir rape, *Brassica campestris* var. *pamirica* Sinsk. is the earliest known, maturing in the north in 40 days. Many of the forms of potato, barley, legumes, etc. from these mountainous districts have done remarkably well in the extreme north of the Soviet Union, beyond the arctic circle on the Kola Peninsular and other such situations and represent in general an invaluable source of material for breeding on physiological lines. For the highland zones of the U.S.S.R., many of which have hitherto been hardly cultivated, these plants are of immense interest, and by their means, either through direct introduction or by breeding, it is hoped to create a flourishing agriculture in all these barren areas.

## PLANT DISEASES 632

1171. Berge, T. O., Riker, A. J. and Baldwin, I. L. 632.3:576.16:635.64
**Correlation of pathogenicity and " viscosity " in cultures of *Phytomonas tumefaciens*.**
Phytopathology **1936 : 26** : p. 86. (Abst.)

Cultures of a strain of *Phytomonas tumefaciens* pathogenic to tomato shewed a lower " viscosity " than non-pathogenic strains as measured by the du Noüy tensiometer. The differences in viscosity appear to be associated with the character of the bacterial gums produced by the cultures.

1172. Lyneis, M., Riker, A. J. and Locke, S. B. 632.3:576.16:635.64
**Comparative physiology of pathogenic and nonpathogenic crown-gall bacteria.**
Phytopathology 1936 : **26** : p. 100 (Abst.)
Studies of the comparative physiology of two strains of *Phytomonas tumefaciens*, one pathogenic to tomato and the other not, have not indicated any physiological characters which are correlated with the difference in pathogenicity between them.

1173. 632.3:576.16:635.64:578.08
Riker, A. J., Pinckard, J. A. and Baldwin, I. L.
**Electrical potentials found in studies on *Phytomonas tumefaciens* and related organisms and on crown gall.**
Phytopathology 1936 : **26** : p. 106. (Abst.)
No correlation was found between pathogenicity and oxidation-reduction potential of bacterial cultures as measured by a vacuum-tube potentiometer. The cultures included a pathogenic and a non-pathogenic strain of *Phytomonas tumefaciens*, the parasite causing crown gall of tomato.

1174. 632.4:576.16:578.081.1
Stakman, E. C., Levine, M. N., Christensen, J. J. and Isenbeck, K.
Die Bestimmung physiologischer Rassen pflanzenpathogener Pilze. (**The identification of physiological races of fungi pathogenic to plants**).
Nova Acta Leopoldina 1935 : (N.S.) : **3** : 281–336.
A comprehensive survey of the techniques used in the detection and identification of physiological races of the Uredineae (*Puccinia* species), Ustilaginae, Erysiphaceae and other fungi. The methods described may be grouped under (1) degree of infection on test varieties of known reaction of the host ; (2) growth conditions on artificial media and (3) the biochemical reaction. The keys provided for identification of the various races are followed in each case by citations of relevant literature.
In conclusion a summary table of techniques is given shewing the pathogen, number of races, distinctive characteristics and reaction, parasitic hosts and the name of the investigator. A general bibliography of 45 references and a number of plates complete the paper.

1175. 632.411.4:576.16:635.64
Röder, K. 632.411.4:576.16:633.491
Untersuchungen über die Phytophthorakrankheit (*Phytophthora infestans*) der Tomate. Unter besonderer Berücksichtigung der biologischen Spezialisation des Erregers. (**Investigations on the resistance to *P. infestans* in the tomato. With particular reference to the biological specialization in the parasite**).
Phytopath. Z. 1935 : **8** : 589–614.
The contradictory results in experiments on the resistance of different tomato varieties to the potato blight parasite may be the consequence of the existence of different physiological forms in this fungus. Experiments were designed therefore to test this assumption.
The characteristics, external and internal, of the infection of the tomato with *P. infestans* are described. Infection tests were then carried out with cultures from six different tomato strains together with the A and S strains (Cf. " Plant Breeding Abstracts," Vol. V, Abst. 620) from the potato. The reaction of 81 tomato varieties was tested. All were attacked by both A and S strains from the potato, the latter strain shewing only slightly greater virulence, and no varietal differences between the tomatoes were evident. Very marked differences in virulence were detected between the cultures from different tomato strains however. Certain highly virulent cultures occurred, which rapidly led to the complete death of the plants. The symptoms were quite different from those produced by the two potato strains, indicating therefore that at least three strains of the parasite must exist. The third, highly virulent tomato strain is named the T biotype. The difference between the strains was detectable only on the leaves, the fruit symptoms being alike for all biotypes.

On Müller's differential potato varieties all the tomato strains reacted identically with the A potato biotype, but the greater virulence of the T biotype was evident in infections of certain other *Solanum* species and related genera including *S. andigenum* and certain other South American potato species. None of the strains used gave an infection with *S. melongena* and the strain attacking the egg plant is therefore thought to represent a fourth biotype.
The reaction of 61 cultures of the A potato biotype on tomatoes was tested but no case of the T biotype was found.
No morphological differences between the two tomato strains were detected. The T biotype apparently occurs in America and Australia as well as in Germany and its origin is ascribed to a similar process to that of the S strain, namely a gradual selection on the tomato from a mixed population.
No varieties or even related species have displayed the least resistance to the T biotype and the tomato varieties hitherto regarded as resistant to *Phytophthora* are thus considered as of little value for breeding against this new physiological form.

1176. SATTLER, F. 632.42:576.16:633
Zur Biologie von *Thielavia basicola* (B. et Br.) Zopf. **[On the biology of *T. basicola* (B. et Br.) Zopf.].**
Phytopath. Z. 1936 : **9** : 1–51.
Part I of this paper deals very fully with experiments on the influence of external environment on *Thielavia basicola* (B. et Br.) Zopf. infection.
Part II records infection tests with 8 strains of *T. basicola* on 7 varieties of tobacco, 5 varieties of beans and 4 species of lupins. From the results it is concluded that sub-species do occur which differ in virulence towards the various hosts. Three groups of the strains used could be established : Group I, highly virulent for beans, lupins and tobacco ; Group II, highly virulent for beans and lupins, non-virulent for tobacco ; Group III, weakly virulent for beans and lupins, non-virulent for tobacco.

1177. 632.42:576.312.35
HEUBERGER, J. W. 632.42:577.8
**Fruit-rotting Sclerotinas. IV. A cytological study of *Sclerotina fructicola* (Wint.) Rehm.**
Bull. Md. Agric. Exp. Sta. 1934 : No. 371 : 167–89.
Contains *inter alia* observations on sexuality in the fungus. The haploid chromosome number was 4 and reduction from the diploid to haploid number must occur at the first of the three divisions in the asci.

1178. VAHEEDUDDIN, S. 632.451.2:575.127.5
**Hybridization between *Sphacelotheca cruenta* and *Sorosporium reilianum*.**
Phytopathology 1936 : **26** : p. 111. (Abst.)
Out of 18 paired combinations of haploid lines of *Sphacelotheca cruenta* (Kühn) Potter and *Sorosporium reilianum* (Kühn) McAlpine inoculated into sorghum seedlings, 11 produced sori, while none of the haploid lines inoculated singly did so. The sori shewed some characters of each parent while the echinulate hybrid chlamydospores were intermediate in size between those of the parents. They germinated readily and produced promycelia and sporidia larger than those of either parent. Some promycelia formed numerous hyphal branches and few or no sporidia.

1179. HOLTON, C. S. 632.451.2:576.16:575.242:575.127.2
**Origin and production of morphologic and pathogenic strains of the oat smut fungi by mutation and hybridization.**
J. Agric. Res. 1936 : **52** : 311–17.
The lines used were a strain of *Ustilago avenae* producing 100 per cent smut on the variety Gothland and 0 per cent on Monarch, a strain of *U. levis* producing 99 per cent smut on Monarch and 0 per cent on Gothland and a pure line strain of the buff smut fungus with hyaline chlamydospores (cf. " Plant Breeding Abstracts," Vol. IV, Abst. 361.) producing 55 per cent smut on

Monarch and 80 per cent on Gothland. The desired crosses were made by isolating the four monosporidial lines from a germinating chlamydospore of each of the three strains and inoculating Anthony oats with sexually compatible combinations.
The buff smut was found to arise in selfed lines of *U. levis* and in interspecific crosses with *U. avenae* only when cultures from the same sporidium were involved and it thus appears to have arisen by mutation in *U. levis*.

From the cross *U. levis* x *U. avenae* there was selected in $F_3$ a *U. levis* segregate producing 92 per cent smut on Gothland and 45 per cent on Monarch. Again, from the cross *U. avenae* x buff smut, a buff smut segregate was obtained in $F_3$ which produced 100 per cent smut on Gothland and 22 per cent smut on Monarch.
It is thus evident that new pathogenic strains have been produced by interspecific hybridization as well as by mutation.

1180. 632.451.2:576.16:633.1(73)
MOORE, M. B. 633.1–2.451.2–1.521.6
**Pathogenicity of different collections of *Ustilago tritici* and *U. nuda*.**
Phytopathology 1936 : **26** : p. 103. (Abst.)
Using the partial vacuum method of inoculation (Cf. Abst. 1199) it was possible to distinguish 5 parasitic races of *Ustilago tritici* in 12 collections from Minnesota, North Dakota, Texas and Mexico, 9 differential varieties of wheat being used.
In barley the results were not consistent enough to permit the separation of parasitic races, but it was found that Trebi is rather highly resistant to the 9 collections of *U. nuda* used.

1181. DODOFF, D. N. 632.452:576.16:633.11(49.7)
**[Physiologic forms of the wheat stem rust (*P. graminis tritici*) in Bulgaria. (I. Contribution).]**
Annu. Univ. Sofia V. Fac. Agron. Sylvicult. 1933/34 : **12** : 334–65.
In all eight physiological forms of *P. graminis tritici* found in 1930, 1931 and 1932 are listed. They include two new forms, 129 and 130, and two forms, 116 and 119, which have been produced artificially (cf. " Plant Breeding Abstracts," Vol. III, Abst. 1) but never before found in nature.

1182. DUNEGAN, J. C. 632.452:576.16:634.2
**The occurrence in the United States of two types of teliospores of *Tranzschelia pruni-spinosae*.**
Phytopathology 1936 : **26** : p. 91 (Abst.)
Evidence is given to shew that the form of *Tranzschelia pruni-spinosae* occurring on peach is identical with *forma discolor* while that on indigenous species of *Prunus* corresponds to *forma typica* ; these two forms have not been previously distinguished in the U.S.A. The two forms have different alternative hosts and though the urediospores are similar they do not cross infect.

1183. CHABROLIN, C. 632.452:577.81
Le cycle evolutif des Uredinées. Revue des travaux sur l'heterothallisme des Uredinées. (**The developmental cycle of the *Uredineae*. A review of works on the heterothallism of the *Uredineae*).**
Ann. Serv. Bot. Tunis. 1934 : (1935) : **11** : 273–83.
In the course of a survey of the literature the biological and genetic proofs of heterothallism in the *Uredineae* and the relevant cytological data are summarized.
Most of the references contained in the bibliography have already been abstracted in " Plant Breeding Abstracts."

1184. CHRISTENSEN, J. J. and DAVIES, F. R. 632.484:575.22:633.16
**Does heterocaryosis account for the production of variants in *Helminthosporium*?**
Phytopathology 1936 : **26** : p. 89. (Abst.)
The hyphal cells, conidia and germ tubes are multinucleate and hyphal anastomoses between races of *Helminthosporium sativum* and other dark-spore species are common. Observations on 468

conidial isolates from 154 individual conidiophores obtained from mixtures of two distinct races or species on agar or on barley shewed however that, with two exceptions, all isolates from the same conidiophore were identical culturally. Similar results were obtained from hyphal tips isolated from conidia derived from colonies giving rise to variants or from mixed colonies on agar drops.
The results are taken to indicate that in the species studied variation is due primarily to nuclear change rather than to heterokaryosis.

1185. Hansen, H. N. and Smith, R. E. 632.484:575.24:575.12
**The origin of new types of imperfect fungi from interspecific co-cultures.**
Zbl. Bakt. 1935 : **92** : 272–79.
In all cases where homogenic strains of *Botrytis cinerea* have been mixed, combinations of the two in single cells or spores have been produced, from which by successive monospore cultures the original types could be segregated out again, together with a third type usually intermediate between the two. This latter type always segregated into the three types again on further single-spore cultures, the other two remained constant.
Similar experiments were made with two distinct species, *B. allii* and *B. ricini*, in which case various new types were produced ; lines entirely resembling either of the parental lines were not recovered from these variants. On the whole the resemblance to *B. ricini* was more pronounced in the segregates than the resemblance to *B. allii*.
Several constant variant lines have been obtained, some worthy of the designation of new varieties or species. No clear evidence of anastomosis was obtained and the new lines are thought to be the result of genic variation in the former species rather than nuclear intermixture.

1186. 632.484–1.521.6:581.192
Ezekiel, W. N., Taubenhaus, J. J. and Fudge, J. F.
**Further study on the nature of immunity of monocotyledonous plants to *Phymatotrichum* root rot.**
Phytopathology 1936 : **26** : 92–93. (Abst.)
Ether extracts of juices expressed from the under-ground parts of the monocotyledonous plants that are immune from *Phymatotrichum omnivorum* root rot contain materials which inhibit growth of the fungus in nutrient solutions.
Similar extractions from susceptible dicotyledons did not impede the growth of the organism and it is suggested that the immunity of monocotyledonous plants is due at least in part to acid, ether-soluble materials.

1187. Jenson, J. H. 632.8:575.24:576.16:633.71
**Studies on the origin of yellow-mosaic viruses.**
Phytopathology 1936 : **26** : 266–77.
By high dilution, single pin-puncture inoculations, ultrafiltration and chemical treatments what were considered to be in many cases single infectious units of tobacco-mosaic virus were obtained; tobacco plants inoculated with these or sub-inoculated from single necrotic lesions produced by them on *Nicotiana Langsdorffii* shewed bright yellow spots in addition to the ordinary symptoms of tobacco mosaic and from these spots yellow mosaic viruses were recovered. The latter are of the " slow-moving " type and usually produce yellow primary lesions only.
Plants inoculated with the yellow mosaic viruses occasionally shewed different symptoms from other plants in the same set indicating that the yellow mosaics also can give rise to other viruses. In all, 51 isolations of yellow mosaic viruses have been made and though many, if not all, of these are considered different from each other, their host reactions and serological properties indicate that they are closely related to tobacco mosaic virus, of which they are here considered to be strains. Their origin, it is suggested, is by some process similar to mutation.

1188. McKinney, H. H. 632.8:575.24:633.71
**Evidence of virus mutation in the common mosaic of tobacco.**
J. Agric. Res. 1935 : **51** : 951–81.

All the collections of common mosaic of tobacco studied ultimately produce small yellow spots on the leaves of infected tobacco plants, from which spots a stable yellow mosaic can be isolated by repeated sub-inoculation. Extensive tests however, using a variety of methods, have indicated the impossibility of obtaining a strain of common mosaic virus from the collections used which does not produce such yellow spots ; it has been shewn moreover that common mosaic is not a mixture.

It is concluded therefore that the occurrence of spots of yellow mosaic represents a form of mutation. Instances are mentioned of other yellow mosaics which from their association with some particular mosaic may also owe their origin to mutation.

In the present case the mutant form, though itself more virulent than the common mosaic from which it arose, could not extend through the tissues of the host in the presence of the latter.

1189. Stanley, W. M. 632.8:576.16
**Chemical studies on the virus of tobacco mosaic. VI. The isolation from diseased Turkish tobacco plants of a crystalline protein possessing the properties of tobacco-mosaic virus.**
Phytopathology 1936 : **26** : 305–20.

A description is given of the extraction of an apparently chemically pure, non-living, crystalline protein from Turkish tobacco plants infected with tobacco-mosaic virus ; the crystalline material in infection is between 100 and 1,000 times more active than ordinary juice preparations from diseased Turkish tobacco plants.

It is concluded therefore that the virus is a non-living, chemical substance and the occurrence of strains of tobacco-mosaic virus (cf. Absts. 1187 and 1188), it is suggested, may be due to the molecules being slightly unstable and undergoing rearrangement or polymerization.

## ECONOMIC PLANTS 633

1190. Sengbusch, R. v. 633:575(43)
Wege, auf denen die Pflanzenzüchtung zur Lösung des Eiweissproblems beitragen kann. (**Ways whereby plant breeding may contribute to the solution of the protein problem**).
Forschungsdienst 1936 : **1** : 260–67.

The subject is treated largely from the economic standpoint. The necessity is emphasized for increasing Germany's output of protein and oil, mainly by breeding the crop plants already in cultivation for the desired characteristics. The newer crops too such as alkaloid free lupins, *Yucca*, *Malva* and soya bean may also be used as material for breeding but not to the same extent.

The importance of suitable methods for the necessary chemical estimations is emphasized.

1191. 633:575:581.192:578.081
Sengbusch, R. v. 633.367:581.192.6:575.1
Chemie und Pflanzenzüchtung. (**Chemistry and plant breeding**).
Forschungsdienst 1936 : **1** : Sonderheft 2 : 22–27.

The function of chemical analysis as an aid to plant selection where a large population has to be examined is mentioned and a brief history of chemical investigations of this nature as applied in the breeding of various crop plants such as sweet lupins and oil plants to obtain types with a particular chemical or other constituent. The application of such principles and the achievements at the Müncheberg Institute in the breeding of sweet lupins, high protein rye for fodder, fibre plants, rhubarb, tomatoes and mustard as referred to as well as the research on the differences in the reactions of varieties to different soil and *p*H conditions. A brief reference is also made to research on the possible varietal differences in lupins as regards their capacity for decomposing certain manures and for supplying nitrogen to the soil.

1192. Demerec, M. 633:575.1.061.6
**Behaviour of chlorophyll in inheritance.**
Symposia on Quantitative Biology, Cold Spr. Harb. 1935 : **3** : 80–86.
For the benefit of students of physiology and chemistry and as a stimulus to co-operative research, a review was given of the main body of facts known about chlorophyll types and their hereditary transmission, with the exception of non-Mendelian inheritance.
A bibliography and a report of the ensuing discussion are appended.

1193. Parodi, L. R. 633:581.6:581.9(82)
Contribution à l'étude des plantes alimentaires indigènes cultivées en Argentine. (**A contribution to the study of indigenous food plants cultivated in the Argentine**).
Rev. Bot. Appl. 1936 : **16** : 177–89.
The list given includes species that are in all probability indigenous and species that have been in cultivation in the Argentine for a very long time and in many cases before the Spanish conquest, such as maize, the soya bean, etc.
The commentary includes observations on characteristics, origin and botanical name of the various plants cited.

1194. Zweigelt, F. 633–2–1.521.6:575
Immunbiologie, Immuntherapie und Immunzüchtung. (**The biology of immunity, immunity therapy and breeding for immunity**).
Gartenztg. 1935 : No. 8 : 92–95.
After a general discussion of the subject the author shews that immunity and resistance represent complex biological relationships between the host and parasite and so are subject to a number of influences, both external and internal. This must be taken into account in breeding for immunity, for though it is inherited on Mendelian lines there will always be a certain amount of fluctuation. Another obstacle in breeding for immunity is the linkage which so often exists between immunity and the undesirable features characteristic of the wild forms. This can only be overcome by back-crossing and by using very large populations, as in Müncheberg where each year millions of vine seedlings are raised in order to select one or two individuals that combine resistance to phylloxera and *Peronospora*. A still further difficulty is that immunity, once obtained, is not a constant thing but has to reckon with the origin of new physiological forms of the parasite.

1195. Dufrénoy, J. 633–2–1.521.6:576.34
**Cellular immunity.**
Amer. J. Bot. 1936 : **23** : 70–79.
In the belief that the modifications in cytological structure corresponding to modifications in cell metabolism may reveal something of the physiological causes linked up with immunity or susceptibility in a given genotype exposed to a certain strain of pathogen under given ecological conditions, a comparative cytological study on normal and diseased cells is presented in this paper.
Among the factors discussed with reference to immunity are cell nutrition, respiration, the evolution of mitochondria and plastids, the physical conditions of the vacuolar material and toxic effects.
A definite correlation is held to exist between increased proteolytic activity of a cell affected by a pathogen and susceptibility and also between rapid generalized precipitation of tannins and resistance. In potatoes exposed to infection by *Synchytrium endobioticum* resistance is stated to depend on the development of a high concentration of phenol compounds in the vacuoles of the cells adjoining infected cells, a condition which checks the development of the sporangia. Similar conditions are declared responsible for resistance to disease in vine and maize seedlings. Unpublished research by the author and another investigator on *Bacterium tumefaciens* suggests the existence of a relationship between hypertrophy or hyperplasy and the oxidation level and the absence of certain genetical factors necessary for the oxidation processes may be correlated with increased susceptibility to common fungi causing damping off, as suggested by De Winton and Haldane.
A bibliography is appended.

1196. 633–2.112–1.521.6

**(Works on the physiology of drought resistance of crop plants).**

Bull. Appl. Bot. Leningrad 1935 : Ser. 3 (8) : Pp. 114.

A collective work consisting of a series of cognate articles as follows :—

I. V. KRASOVSKAJA — *The limiting humidity of the soil for the development of the nodal roots of cereals.* (*pp. 5–30*).

The capacity of the sorghum and maize types of cereal to form adventitious roots at low humidities is shewn to be an important factor in their drought resistance and one to be borne in mind in making selections.

E. I. NESTEROVA — *Resistance to soil drought in certain varieties of spring wheat.* (*pp. 31–51*).

Experiments on the effect of artificial wilting during different periods of development shewed that the number of leaves that died under wilting was not a fixed criterion of the degree of drought resistance in wheat varieties, nor was the water content during wilting. The degree of resistance of the varieties determined by their yield after wilting is different in different growth phases, the late varieties being the more tolerant of early droughts and the early varieties of late droughts. Clear varietal differences in drought resistance were observed, the most resistant during the earing period being *Erythrospermum* 0841, while Kitchener and *Graecum* 0289 were also classed as resistant. Resistance to low soil humidity, as opposed to resistance to wilting, was displayed by *Graecum* 0289.

M. G. VOLKOVA and M. I. RUSSIJAN. — *The methods of determining drought resistance in soya beans.* (*pp. 52–64*).

Similar observations on five soya bean varieties differing in drought resistance shewed that neither the water content of the leaves at a given time of day nor the percentage loss of water during the day could be used as direct criterions of the drought resistance of a variety. The degree of opening of the stomata was correlated with the percentage water loss and so could also not be used as a reliable criterion.

V. I. ERŠOV. — *Resistance of various ecological types of oat to soil drought.* (*pp. 65–100*).

Potato experiments were made upon a large variety of oat forms, especially of those presenting interest for breeding or introduction. Special attention was given to the oats growing in arid countries. The plants were subjected to drought at three different periods of their development and their reactions observed in detail. The forms studied were thus classified according to their degree of resistance to drought at different growth periods. In addition to the amount of wilting observations were also made on the final yield of grain and straw, thousand grain weight, time of maturity and the water content of the leaves in the different varieties after different drought treatments.

The forms reacted differently to drought at different stages. In the tillering stage it produced a slight excess of yield in *Avena byzantina*, *A. strigosa* and *A sativa* var. *volgensis*. Drought during earing produced the worst damage in *A. sativa* var *aristata* and the least in *A. byzantina*. *A. brevis* was much less resistant to early drought than *A. strigosa* but more resistant at the earing stage. It is thus thought that by hybridization of these two species, the two types of resistance could be combined.

The most resistant forms were not by any means always the highest in yield, though some of the *A. byzantina* forms gave the highest yields after drought at earing. They were also distinguished by a lower rate of water loss from the leaves during drought. They shewed signs of wilting however much earlier and quite often were completely wilted when the more susceptible varieties were apparently unaffected. The actual water content of the leaves did not correspond to the degree of wilting, e.g. *A. brevis* shewed a much more serious wilting than *A. strigosa* whilst containing distinctly more water.

M. P. FEDOSEEVA. — *Physiological tests of the influence of protective forest belts on plants.* (*pp. 101–14*)

The use of such belts is shewn to be a valuable way of reducing drought.

## CEREALS 633.1

1197. 633.1:575(49.5)
GESCHER, N. VON 633.1:575.42(49.5)
**The selection of cereals in the Mediterranean countries : Greece.**
Int. Rev. Agric. 1936 : **27** : T 1–9.
The main features of a similar survey on the development of cereal breeding in Greece have been reviewed in " Plant Breeding Abstracts " Vol. VI, Abst. 130.

1198. FLEISCHMANN, R. 633.1–2.112–1.521.6(43.91)
Die ungarische Pflanzenzüchtung im Kampfe gegen Dürrekatastrophen. (**Hungarian plant breeding in the campaign against drought**).
Matér. Étude Calam. 1934 : No. 34 : 99–113.
Statistics are given shewing that over a period of 947 years the greatest number of famines in Hungary have been caused by drought. Through the breeding of drought-resistant varieties the position has now been reached that the effects of the major droughts are very much reduced, and the minor ones have no effect at all. This has been achieved by breeding drought-resistant forms from the ancient Hungarian land wheats and also by crossing these land wheats with Marquis. The production of earlier maturing varieties has also contributed to the reduction of the risk from drought.
Similar progress has been made with maize and forage plants and another method which is being tested in the latter case is the introduction of a new wild species into cultivation.

1199. MOORE, M. B. 633.1–2.451.2–1.521.6:578.081
**A partial-vacuum method for the inoculation of wheat and barley with loose smuts.**
Phytopathology 1936 : **26** : p. 103. (Abst.)
MOORE, M. B.
**A method for inoculating wheat and barley with loose smuts.**
Phytopathology 1936 : **26** : 397–400. (Abst.)
An appartus is described in which individual heads of wheat or barley are inoculated with loose smuts by subjecting them to a partial vacuum while completely submerged in an aqueous suspension of chlamydospores. With susceptible varieties of wheat and barley the method has given an average percentage of smut of 58 and 43 respectively.

## WHEAT 633.11

1200. 633.11:575(44)
633.11:575(45)
La selección del trigo en los países mediterráneos. (**Wheat breeding in Mediterranean countries.**)
Agricultura, Madrid 1936 : **8** : p. 317.
A brief reference to the achievements of wheat breeders in France, Italy and other Mediterranean countries.

1201. 633.11:575(49.5)
**Wheat selection at the research station for improving crop plants in Salonika.**
Int. Rev. Agric. 1935 : **26** : T 514–15.
In addition to the introduction of exotic varieties possessing advantages over native varieties in respect of precocity, resistance to rust, drought, etc., during the last eight or nine years several new varieties have been bred suitable for red clay soils.
Further breeding work now in progress includes the production of varieties with the ecological characters of Mentana and resistance to blast and varieties suitable for red soils and resistant to drought.
The drought resistance, acid avidity and baking value of native varieties have been studied.

1202. 633.11:575.12(49.5)
HERMANN, F. 633.11 *T. elongatum* x *junceum*
Ein neuer Weizenbastard aus Thrakien. (**A new wheat hybrid from Thrace**).
Repert. Spec. Nov. Fedde 1935 : **39** : p. 128.
The hybrid *Triticum elongatum* x *junceum*, found in eastern Thrace in 1927, is described in Latin.

1203. LACOUDRE, M. 633.11:575.12:664.641.016:578.081.1
Détermination de la valeur boulangère des hybrides par la méthode Pelshenke. (**Determination of the baking value of hybrids by the Pelshenke method**).
Sélectionneur 1935 : **4** : Fasc. 3–4 : 30–34.
Some discrepancies between the results of tests of baking value of 1934 and 1935 wheats have raised the question of the value of the Pelshenke method of estimating quality.
A number of hybrid lines and control wheats were tested and the results are briefly stated with some comments in the increase in baking value of the control.

1204. DUSSEAU, A. 633.11:575.127.2
Un hybride particulier de deux blés tendres : *Triticum haplodurum*. (A **peculiar hybrid of two soft wheats** : *T. haplodurum*).
C. R. Ass. Franç. Av. Sci. 1933 : **57** : 281–82.
From a cross of Blé de Padoue (*T. vulgare*) x Inalettabile 38 (*T. vulgare lutescens*) made in 1926, a perfectly normal $F_1$ was obtained but two durelloid plants appeared in the $F_2$. One of these segregated on further breeding. Its behaviour towards the rusts and a large number of other fungi, which is described, shewed it to be more allied to *T. durum* than any other species, but cytological examination shewed it to possess only 14 somatic chromosomes, giving 7 regular pairs at meiosis.

1205. MATSUMURA, S. 633.11:575.127.2:576.356.5:575.113.42
[**Genetic studies in pentaploid wheat hybrids. (A preliminary note).**].
Jap. J. Genet. 1936 : **12** : 25-26.
The relationships were investigated between various characters in reciprocal hybrids ($F_2$ and $F_3$) of *Triticum polonicum* (4x) x *T. Spelta* (6x) and the number of chromosomes on the one hand and the particular genom involved (A, B or D) on the other.
Ear density was found to be conditioned by factors in various chromosomes of the D genom and a certain degree of cumulative effect was observed. Hollow straw on the other hand proved to be controlled by factors in a single chromosome of the D genom.
The factors for both awns and pubescence of the stem nodes are located in the same chromosomes of either the A or B genom and no cumulative effect was observed. The characters, pubescent glume and long outer glume, are conditioned by factors in different chromosomes of either the A or B genom.
Evidently the genes for features correlated with the number of chromosomes are situated in the D genom, while the other features not thus correlated are conditioned by genes in genom A or B.

1206. LAUMONT, P. and SIMONET, M. 633.11:575.127.5:633.11 *Aegilops*
Etude génétique et cytologique des formes tendroïdes apparues dans la descendance de l'hybride intergénérique *Aegilops triuncialis* L. x *Triticum durum* Desf. (**Genetic and cytological study of the tendroid forms arising in the progeny of the intergeneric hybrid *Ae. triuncialis* L. x *T. durum* Desf.**).
C. R. Acad. Sci. Paris 1935 : **200** : 1545–47.
Having referred to the $F_1$–$F_3$ results from this cross (cf. " Plant Breeding Abstracts," Vol. III, Abst. 622 and Vol. IV, Absts. 952 and 953) the segregation in $F_4$ is recorded as 143 tendroid, 47 speltoid, 55 durelloid and 1,012 aegylopiform.
The appearance of speltoid and tendroid types in $F_2$ and $F_3$ may be due to factorial recombinations and some of these forms were found to have the same chromosome number as the soft wheats ($2n = 42$).

The following chromosome numbers were derived from cytological studies : durelloid types 2n 28—29, speltoid 2n = 46—44 and 43, 42—41 and tendroids 2n = 41—42, thus shewing these types to have the same (or very nearly the same) chromosome formula as the morphological types to which they belong namely *T. durum, T. Spelta* and *T. vulgare*. The chromosome number found for the aegylopiform type, 2n = 46, differs from the *Aegilotricum* number 2n = 56, recorded by Tschermak and Percival.
The stable tendroid types like *T. vulgare* are regarded as possible evidence of the role of certain *Aegilops* species and the *durum* wheats in the origin of soft wheat.

1207. Oehler, E. 633.11:575.127.5:633.11 *Aegilops*:575.129
Untersuchungen an einem neuen konstantintermediären additiven *Aegilops*-Weizenbastard (*Aegilotricum triuncialis-durum*). [**Investigations on a new constant intermediate additive *Aegilops*-wheat hybrid** (*Aegilotricum triuncialis-durum*).]
Züchter 1936 : **8** : 29–33.
In 1931 *Ae. triuncialis* var. *typica* was crossed with *T. durum* var. *lybicum*. Of the 29 $F_2$ plants that flowered two resembled the $F_1$ in all vegetative characters and in the characters of the ripe ear, and produced a uniform $F_3$.
The plants, which were very like *Aegilotricum triuncialis-dicoccum*, were self fertile and had 56 2n chromosomes, are described.
Among the $F_2$ plants were some assumed to be triple hybrids, the result of crossing with an unawned *T. vulgare*.

1208. Liljefors, A. 633.11:575.127.5:633.14:576.354.4
Zytologische Studien über den $F_1$-Bastard *Triticum turgidum* x *Secale cereale* (**Cytological studies on the $F_1$ hybrid *Triticum turgidum* x *Secale cereale***).
Hereditas, Lund 1936 : **21** : 240–62.
The somatic chromosome number of each of the two hybrids, A, *T. turgidum* var. *dinurum* x Sangaste rye and B, *T. turgidum* var. *lusitanicum* x Midsommar rye was 21, 14 from the wheat and 7 from the rye parent.
At metaphase I in hybrid A, from 0 to 6 bivalents occurred, the average number being 1·6 per cell, a trivalent also occurred in about 4 per cent of the cells, the maximum pairing observed being represented by $1_{III} + 5_{II}$. The univalents were usually scattered over the spindle, but in exceptional cases were grouped on the equator or at the poles.
At anaphase I those univalents lying on or near the plate divide, the others going to the poles undivided. Bivalents at this stage usually disjoined regularly but occasionally a chromatin bridge and fragment were produced, indicating a relatively inverted segment. Other evidence of structural inequalities was provided by unequal bivalents and ring-shaped univalents. Chromosome fragments also appeared to be formed by transverse fusion of paired chromosomes. A search for restitution nuclei or evidence of such yielded negative results.
From a comparison with other published work on auto- and allosyndesis in wheat and wheat hybrids and with the genetical results from wheat-rye hybrids it is concluded that the chromosome pairing in this hybrid is probably exclusively autosyndetic. Unequal pairs and multivalent formation are ascribed to structural differences.
The hypothesis that *T. vulgare* arose from a *T. dicoccum* x rye cross is considered to be disproved by the fact that no more bivalents occur in tetraploid wheat-rye hybrids (2n = 28) than in triploid hybrids (2n = 21).
Meiosis in the hybrid B was markedly different from that in A, being characterized by a stronger contraction of the chromosomes, which were almost spherical in the univalent conditions, and by greatly reduced pairing, the average number of bivalents per cell being 0·2 and the maximum 2. The chromosomes often failed to separate at anaphase I, but only rarely were restitution nuclei produced as the cell wall formed after the first division usually cut through the chromatin clump and so two cells and two nuclei were formed.
It is suggested that the strong contraction in this case is due to a disturbance of spiral formation, as a result of which chiasma formation and hence metaphase pairing is reduced (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 319).

1209. 633.11:575.129:575.127.2
KOSTOFF, D. 633.11 *T. Timopheevi*:575.127.2
**Studies on the polyploid plants. XI. Amphidiploid *Triticum Timopheevi* Zhuk. x *Triticum monococcum* L.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1936 : **1**(X) : 37–41.
Hybrids of *T. Timopheevi* with *T. vulgare* (Novinka), *T. Spelta* and *T. persicum*, though they are highly sterile and rarely set seeds in Leningrad, were slightly more fertile in Moscow and one of the hybrid plants set 16 seeds. The back-crosses of the hybrids on to the parental and other species however displayed somewhat greater fertility.
The hybrid *T. Timopheevi* x *T. monococcum* was pollinated by a triple hybrid of *T. turgidum* x *T. dicoccum* x *T. vulgare* in the fourth generation, having 28 chromosomes. From this cross one large grain was obtained and gave rise to a plant with 42 chromosomes. This plant was morphologically identical with the *T. monococcum* x *T. Timopheevi* hybrid. It was fertile and shewed no trace of the characters of the pollen parent and is in fact a parthenogenetically produced amphidiploid of *T. Timopheevi—monococcum* having probably originated from an unreduced egg with 42 chromosomes.
The new amphidiploid, named *T. Timococcum*, possesses all the valuable immunities of its two parental species (see " Plant Breeding Abstracts " Vol. V, Abst. 649) and experiments are to be made in crossing it with *T. vulgare*.

1210. FLORELL, V. H. 633.11:575.129:633.14:576.356.4
**Chromosome differences in wheat-rye amphidiploid.**
J. Agric. Res. 1936 : **52** : 199–204.
The amphidiploid studied arose from the cross Purplestraw wheat x Abruzzes rye, the $F_1$ being back-crossed to Purplestraw and the back-cross progeny again crossed with rye. In the root tips 56 chromosomes were found, the wheat and rye chromosomes being indistinguishable.
At the first metaphase of meiosis 28 pairs were observed and here the rye chromosomes could be distinguished, as they were larger than the wheat chromosomes, stained less deeply, often shewed a banded appearance and tended to arrange themselves on the edge of the metaphase plate. It is suggested that the amphidiploid complement was built up by the functioning of unreduced gametes in each back-cross.

1211. UCHIKAWA, I. 633.11:575.242:575.11:576.356.5
**(Cytogenetical studies on speltoid wheat).**
Jap. J. Genet. 1936 : **12** : 53–56.
A genetical study was made of two *A* type, three *B* type and three *C* type speltoids received from Huskins and termed *AI*, *AII* ; *BI*, *BII*, *BIII* ; and *CI*, *CII* and *CIII* respectively.
Segregation in *AI* and *AII*on the one hand and also in *BI*, *BII* and *BIII* on the other proved these two groups to belong to the *A* and *B* types. The *CI* segregated 1 : 1 ; but *CII* and *CIII* gave *B* type form of segregation.
In *AI* and *AII* the normal plants were unawned, semi-awned in the heterozygote and awned in the homozygote. *B* and *C* types were awned in the normals, heterozygotes and homozygotes. The *B* and *C* homozygous speltoids exhibited short stems, weak growth and sterility.
A number of deviations from the cytological findings of Huskins and Winge were noted in the *A* and *C* types. In the *C* type material the author found the diploid number to be 42 and tetravalents were observed in both normal and heterozygous forms. Unequal pairs were also observed in the heterozygote and a short pair in the homozygote. The author proposes as the formula for the *A* type $\frac{ABC, ABC \quad ABC^m}{ABC, ABC^m \quad ABC^m}$ (where *m* denotes mutated genes); while for the *C* type $\frac{ABC \; ABC \; ABS}{\overline{ABC} \; \overline{ABS} \; \overline{ABS}}$ is suggested.
The *CI* ratio is attributed to the fact of gametes bearing $S_1$ (i.e. short chromosome) being weak and $S_1$ pollen generally unsuccessful in competition for fertilization.
Hence while *A* type speltoids are apparently due to mutation in one or several *C* chromosomes, *B* and *C* type speltoids are caused by abnormal chromosome combination.

1212. 633.11:576.356.5:581.036.1
633.14:576.356.5:581.036.1
DORSEY, E. 633.11:575.129:633.14
**Induced polyploidy in wheat and rye. Chromosome doubling in *Triticum*, *Secale* and *Triticum-Secale* hybrids produced by temperature changes.**
J. Hered. 1936 : **27** : 155–60.

The treatment applied consisted in emasculation, pollination, keeping the plants at a constant temperature of 25°C. during the interval between pollination and fertilization (about 20 hours) and then increasing the temperature to 43°C. for 20–30 minutes, temperatures being measured by means of thermo-couples placed near the spikes and between the lemma and palea of one flower on a spike.
In this way the following polyploids were obtained : *Triticum durum* var. Marouani (2n = 56), *T. durum* var Kubanka (2n = 56), *T. vulgare* var. Forward x *T. compactum* var. *Jenkin* (2n = 84), *T. polonicum* Polish (2n = 56), *T. vulgare* var. Honor (2n = 84), *T. vulgare* var. Forward (2n = 84), *S. cereale* var. Rosen (2n = 28).
Brief descriptions of the different polyploids are given. The most strikingly different were the two from *T. vulgare*, which tillered profusely but grew no higher than six inches and produced no flowers until subjected to long day treatment. Attempts to obtain seed from them have failed, but they can be propagated vegetatively.
In all fifteen cases of chromosome doubling were observed among the plants produced from 426 viable seeds obtained.

1213. VASILJEV, B. 633.11 *T. durum*: 576.356.52
**A haploid plant of durum wheat, *Triticum durum* Desf.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1936 : **1**(X) : 243–44.

In 1934, 120 flowers of *T. durum melanopus* 069 were pollinated with *T. monococcum flavescens*, only two grains being obtained. One of these was intermediate between the two parental species in characters and an undoubted hybrid. The other was different in type. Its anthers were defective and it set no seed by pollinating with either parent. This plant had only 14 chromosomes in its root tips, the first mentioned having 21. It is evidently a haploid *T. durum*, formed by parthenogenesis induced by the distant hybridization.
The haploid displays several characters reminiscent of the haploids of *T. persicum* and of *T. dicoccum* and also characters resembling those of the 14 chromosome species *T. monococcum* itself.

1214. ÅKERMAN, Å. 633.11:581.142:575.061.6
Über die Keimungsverhältnisse und Auswuchsneigung rot- und weisskörniger Weizensorten. (**On the germination and tendency to sprout in the ear of red and white grained varieties of wheat).**
Züchter 1936 : **8** : 25–29.

Further experiments fully confirm the conclusions of Nilsson Ehle that the white grains are much more prone to germinate and sprout in the ear than the red grains.
The use of Molin's method shewed greater diastase reaction in the white grains. Crosses were made between red and white grained varieties, and the red and white grains respectively among the progeny shewed the same relative reaction.
It is recognized that it is not the white colour that causes the effect but some gene linked to it and other factors are likely to affect the reaction. Also cases in which the linkage is broken may occur.

1215. Osseledetz, P. 633.11:581.162.3:578.08
**(Methodics and techniques of wheat hybridization).**
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1933 : **10** : No. XXXVI : 107–12.
In crossing varieties with different times of maturity the late parent can be accelerated by vernalization or other means and the early parent retarded by cutting off the leaves, a method recommended by Orlovskii. For convenience of operation only 10–12 florets, all at the same side of the ear, are emasculated and the remainder are removed. Full directions are given for carrying out emasculation, bagging, pollination and all the other operations.

1216. Rosenquist, C. E. 633.11:581.46:581.48
**The influence of the awn upon the development of the kernel of wheat.**
J. Amer. Soc. Agron. 1936 : **28** : 284–88.
Using comparable ears in the $F_2$ of a cross between Garnet (nearly awnless) and Prelude (fully awned) so as to avoid varietal differences, it was confirmed that the presence of awns on the florets of wheat tends towards the production of heavier grains.

1217. Eig, A. 633.11 *Aegilops*:582
*Aegilops* L. (*Aegilops* L.).
Pflanzenareale 1936 : **4** : 43–50.
Though based mainly on the author's previous monograph on *Aegilops* the present work has taken into account recent additions to our knowledge of this genus and the sub-genus *Amblyopyrum* is no longer included under *Aegilops* but has been established as an independent genus. The remaining 27 species are grouped into 5 sections, *Platystachys* Eig, *Pachystachys* Eig, *Monoleptathera* Eig, *Macrathera* Eig, *Pleionathera* Eig, the last named being the most polymorphic and containing the greatest number of species sometimes very difficult of definition. Also *Pleionathera* is recommended as material for a study of the interspecific relations by means of crosses between the various species of this section. Such investigations might, it is suggested, lead to a refutation of the theory (current among geneticists) of an extensive differentiation of the genoms in the *Aegilops* species.
In the geographical treatment of the genus the area of distribution of the genus and of the various species is described and illustrated by maps.

1218. Bonjour, A. A. 633.11–1.557:519.241.1
Fertilidad relativa y producción de grano por planta y por tallo. Estudio de la variación y covariación de los tres factores en las plantas selectas de diez trigos de pedigree. **(Relative fertility, yield per plant and yield per culm. Study of the variance and covariance of these three factors in the selected plants of ten pedigreed wheats).**
Arch. Fitotécn. Uruguay 1935 : **1** : 135–47.
An analysis was made of the fertility, yield per plant and yield per culm in ten different locally bred varieties, taken from records covering 21 years of observation, the fertility being calculated by dividing the number of grains per ear by the number of rachis segments. Positive correlations were observed between yield per plant and per culm and these were both correlated with fertility, the correlations being significant in the case of certain varieties and not in others.

1219. Straib, W. 633.11–2.191:575.11
Untersuchungen über erbliche Blattnekrosen des Weizens. **(Investigations on hereditary leaf blotch in wheat).**
Phytopath. Z. 1935 : **8** : 541–87.
The blotching in question was first observed in the variety Heines Kolben in 1928, in plants that had been infected with *Puccinia glumarum* race 4. The symptoms strongly resembled the 0 degree of infection with the rust parasite and it was thus important to study the disease further. In the following year observations were made on the progeny of diseased plants, some of which again shewed signs of blotching, this time without infection with the rust. Examinations were

made on 1,200 other varieties of 21 chromosome wheat but no case with exactly identical symptoms was found, though certain rather similar phenomena were noted in two other varieties of *T. vulgare* and one of *T. compactum*. Somewhat similar though not identical cases were observed in a number of different varieties of *T. durum* and *T. polonicum*. More detailed examinations shewed that the malady consists in the gradual degeneration of the chlorophyll in all chlorophyll-bearing cells, especially when the plant is grown at rather low temperatures, under 15°C., and is accompanied by a marked loss in nitrogen. All the observations made so far indicate that the malady is not connected with any organism or virus. It is influenced by the presence or absence of various mineral elements in the soil, but the addition of manganese entirely fails to remove the symptoms, as it does in the case of grey spot in oats, to which the disease is otherwise very similar ; a further point in which it differs from grey spot is that the wheat blotching is accentuated, not cured, by suitable additional doses of $CO_2$. The symptoms of the disease in the field, and the other maladies with which it may easily be confused, are indicated in detail ; it is possible that some of these are of an analogous hereditary nature. Differences in yield were observed amounting to between 7 and 21 per cent in favour of the normal as against the necrotic plants. The fact that lines exhibiting the disease may be present in the field and not detectable owing to the absence of suitable temperature and other conditions for its manifestation is therefore of some practical importance.

By repeated selection over a number of years constant necrotic and normal lines were selected from the same original family. Once constancy was attained no case of reversion to the normal was observed. Reciprocal crosses were made between the normal and blotched lines and the normal type was shewn to be fully dominant in the $F_1$ generation, no difference being noted between the reciprocal hybrids ; the character is thus presumably controlled by a nuclear gene. The $F_2$ generations were grown at different temperatures and the number of necrotic plants varied in accordance with the temperature, becoming gradually less with increasing temperature. That a single factor is responsible for the necrosis however is shewn by the examination of the $F_3$ generation ; a slight deficiency in necrotic plants is explained by the variability of the character and the somewhat limited number of plants (20—30 per family) examined. Thus of 60 normal $F_2$ families 22 were homozygous normal and 38 heterozygous, giving segregation in the $F_3$. The gene is named *Nec nec*. Considerable differences were observed between the individual homozygous necrotic families, especially in the time at which the effects appear and it is suggested that modifying factors may also be operative.

1220. Briggs, F. N. 633.11–2.451.3–1.521.6:575.11

**Inheritance of resistance to bunt, *Tilletia tritici*, in hybrids of Turkey wheats C.I. 1558 B and C.I. 2578.**

Hilgardia 1936 : **10** : 17–25.

The segregation in $F_2$ and $F_3$ of crosses of the resistant lines Turkey 1558B and Turkey 2578 with the susceptible variety Baart shewed that each of the Turkey lines differed from Baart in one incompletely dominant factor for resistance to bunt. The collection of bunt used has been designated physiological race III of *Tilletia tritici* by Reed.

Neither of the Turkey lines gave any susceptible rows in $F_3$s of crosses with Turkey 3055, a line which is known to carry the Turkey factor for resistance (Cf. " Plant Breeding Abstracts," Vol. IV, Abst. 668) but in crosses with Martin gave approximately 1 susceptible : 15 resistant $F_3$ rows. Thus Turkey 1558B and Turkey 2578 are shewn both to carry the Turkey factor.

1221. 633.11–2.451.3–1.521.6:575.11

Schlehuber, A. M. 633.11:581.4:575.11

**Wheat inheritance : reaction to four bunt biotypes, spike density, and seed color.**

Bull. Wash. Agric. Exp. Sta. 1935 : No. 323 : (Tech. Pap.) Pp. 32.

The inheritance of reaction to forms T–1, T–2 and T–13 of *Tilletia tritici* and to form L–5 of *T. levis* was studied in the crosses Albit x Minhardi and Albit x Buffum 17.

All three parents are susceptible to T–2 and T–13 and the $F_2$ and $F_3$ progenies were also susceptible. Albit however, is immune to T–1 and L–5 while Minhardi and Buffum 17 are susceptible.

In the cross Albit x Minhardi the segregation in reaction to T–1 in $F_2$, studied by the breeding behaviour of the $F_3$, gave by division at the classes of minimum frequency a close fit to a ratio of 7 smut-free : 4 intermediate resistant : 4 intermediate susceptible : 1 susceptible, which is explained on the basis of two main factors either of which confers immunity when homozygous. Reaction to L–5 shewed a high correlation with reaction to T–1 in the hybrid progeny, but the segregation was slightly different. An inhibiting factor I was postulated, introduced by Minhardi and affecting the expression of one of the main factors, which are the same as those governing resistance to T–1. Albit is thus represented as $A_1A_1A_2A_2ii$ and Minhardi as $a_1a_1a_2a_2II$, $A_1$ and $A_2$ being the main factors for resistance to T–1 and L–5, and T being the inhibiting factor.

The low number of families in the cross Albit x Buffum 17 prevented a satisfactory analysis but there are indications that Buffum 17 carries an additional factor for resistance and an inhibiting factor *Ib* which affects both the factors carried by Albit. A high correlation, similar to that observed in the previous cross, was found between reaction to T–1 and to L–5.

Albit is a club wheat while Minhardi and Buffum 17 are both lax. Segregation into 3 dense : 1 lax in $F_2$ was observed in each cross, though there was a considerable range of forms in each class.

Albit has white grains while Minhardi and Buffum 17 have red grains. In $F_2$ 15 red : 1 white-grained forms were obtained, indicating a two factor difference, which was confirmed by the further segregation.

No connexion appeared to exist between ear density and reaction to T–1, but there were slight indications of association between grain colour and smut reaction in the cross Albit x Minhardi.

1222. Schlehuber, A. M. 633.11–2.451.3–1.521.6:578.081
**Can different degrees of bunt resistance be recognized in $F_2$ plants ?**
J. Amer. Soc. Agron. 1936 : **28** : 266–70.

A study of the smut infection by a composite inoculum in $F_3$ families derived from $F_2$ plants shewing different degrees of infection indicated clearly that the degrees of infection distinguished in $F_2$ were really different. Thus it was found that from smut free and 20 per cent smutted $F_2$ plants in a cross between a susceptible and a resistant wheat, $F_3$ families could be obtained with more smut resistance than either parent ; from 50 and 80 per cent smutted $F_2$ plants, however, it is impossible to obtain families even as resistant as the resistant parent.

1223. Costantin, J. 633.11–2.452–1.521.6
Le problème des rouilles du blé à l'heure présente. (**The problem of rusts of wheat at the present time**).
Ann. Sci. Nat. Bot. 1935 : Sér. 10 : **17** : Fasc. 2 : pages I–XVIII.

The views put forward in this paper have already been referred to in a previous exposition (Cf. " Plant Breeding Abstracts," Vol. V, Abst. 89).

The significance of altitude and latitude as factors in disease resistance is stressed and the work of Burton that has been done in Kenya on wheat resistance is mentioned.

Tests of the rust resistance of a number of wheat samples from Kenya were made in France but without definite results as most of the test plots were destroyed by a storm.

1224. Waldron, L. R. and Clark, J. A. 633.11–2.452–1.521.6:575
**Breeding rust-resistant spring wheats.**
Science 1936 : **83** : 106–08.

The progress in breeding rust-resistant wheats culminating in the production of such varieties as Hope, Thatcher and very recently a new variety Apex bred from Iumillo and H–44 (an allied strain of Hope) is outlined ; and the importance of Hope wheat in various new hybrids that are being evolved is pointed out. The existence of many rust forms has not seriously complicated the problem of obtaining resistant forms.

1225. 633.11–2.452–1.521.6:575.172.3

NEATBY, K. W. 633.11–2.42–1.521.6:575.172.3

**Factor relations in wheat for resistance to *Puccinia graminis tritici*, *Puccinia glumarum* and *Erysiphe graminis*.**

Phytopathology 1936 : **26** : 360–74.

The variety H–44–24 is extremely resistant to *P. graminis* in the field (mature plant reaction) and, in the greenhouse (seedling reaction), to the physiological forms used ; it is semi-resistant to the form of *P. glumarum* used, resistant to *Erysiphe graminis* and its straw is red. Marquis is susceptible to *P. graminis* both in the field and greenhouse and to *E. graminis*, moderately susceptible to *P. glumarum* and has white straw. The relations between these different characters were studied in the sixth generation of the cross H–44–24 x Marquis. It was found that lines carrying the mature plant resistance of H–44–24, which is determined by a single dominant gene, independently of seedling reaction, were semi-resistant to *P. glumarum* and also that, when only such lines were considered, those susceptible to *E. graminis* were resistant or moderately resistant to *P. graminis* form 36 in the greenhouse, while those susceptible or semi-resistant to form 36 were resistant to *E. graminis*.

The variety Marquillo is moderately resistant to the physiological forms of *P. graminis* used in both the seedlings and the mature plants, but has no mature plant resistance in the sense that H–44–24 has. It is highly resistant to *P. glumarum* and has red straw. In $F_6$ lines of the cross Marquillo x H–44–24, the high resistance to *P. glumarum* characteristic of Marquillo was not correlated with the field reaction to *P. graminis*, but as in the last cross, lines carrying the semi-resistance of H–44–24 to *P. glumarum* also carried its mature plant resistance to *P. graminis*. An important result of this is that in these two crosses semi-resistance to *P. glumarum* in the greenhouse may be taken as an indication of mature plant resistance to *P. graminis* in the field. In the second cross there was a negative correlation between greenhouse reaction to *P. graminis* form 52 and *P. glumarum*, lines resistant to the former tending towards susceptibility to the latter, and vice versa. There was a slight tendency for lines susceptible to *E. graminis* to be concentrated in the groups moderately and semi-resistant to *P. graminis* form 52.

The variety Double Cross is moderately resistant to *P. graminis* in the field, highly resistant to *P. graminis* forms 21 and 35 in the greenhouse, highly resistant to *P. glumarum* and has pale red straw. Garnet is susceptible to *P. graminis* in field and greenhouse, semi-resistant to *P. glumarum* and has red straw. Both varieties are susceptible to *E. graminis*. In $F_6$ lines of the cross Garnet x Double Cross, resistance to *P. glumarum* was inherited independently of field reaction to *P. graminis*. The susceptibility of Garnet to form 35 of *P. graminis* was not recovered but there was, as in the last cross, a negative correlation between greenhouse reaction to *P. graminis* form 35 and *P. glumarum*. Double Cross inherits its high resistance to *P. glumarum* from Marquillo and it therefore seems that the genes determining resistance to *P. glumarum* in Marquillo are also responsible for its susceptibility to certain forms of *P. graminis*. With one exception, lines from this cross susceptible to *P. graminis* form 21 had red straw ; apart from the exception, which may be due to natural crossing or wrong classification, this can be explained by assuming that two genes are involved in the inheritance of straw colour and that the presence of one of them is essential for susceptibility to form 21.

Apart from the cases described the characters studied in the different crosses were inherited independently. It is believed that the associations found are more probably due to pleiotropic action of the genes concerned than to genetic linkage.

1226. 633.11–2.484–1.521.6:632.111

LAROSE, E. and VANDERWALLE, R. 633.11-2.42–1.521.6:632.111

Les maladies du pied chez le froment. Résistance au froid des variétés et présence de *Cercosporella herpotrichoides*, Fron. Influence de divers facteurs sur le développement d'*Ophiobolus graminis*, Sacc. (**Foot-rots of wheat. Resistance to cold of the varieties and the presence of *C. herpotrichoides*, Fron. The influence of various factors on the development of *O. graminis* Sacc.**)

Rapp. C.R. Journées Nat. Prot. Sanit. Pl. Cult. Bruxelles 1935 : 18–19–20 October : Pp. 10.

The varieties most susceptible to cold were most attacked by *Cercosporella*.

There was no correlation between hardiness and resistance to *Ophiobolus graminis* and none of the varieties studied shewed any special resistance.

1227. SCHARNAGEL, T. 633.11:664.641.016(43)
Die ersten 1000 deutschen Kleberweizenuntersuchungen. (**The first 1000 German high gluten wheat tests**).
Z. ges. Getreidew. 1936 : **23** : 7–10.
The first 1,005 wheat samples sent for certification to the Weihanstephan laboratory after the new laws for ensuring the production of only strong wheats have very clearly shewn that the best samples invariably belong to certain definite varieties. The new variety Tassilo has proved unquestionably the best among the winter wheats, the next two varieties being Kraffts Siegerländer and Hanters Pfälzer. In summer wheats a new variety Eglfingar Hohenstaufen has given uncommonly high values, and Janetzki also received good marks.

1228. KLEMT, G. and SCHMIDT, E. A. 633.11:664.641.016(43)
Die Ergebnisse der ersten Kleberweizenuntersuchungen der Versuchsanstalt für Getreideverarbeitung in Berlin. (**The results of the first high gluten wheat tests of the experiment station for cereal testing in Berlin**).
Z. ges. Getreidew. 1936 : **23** : 20–23.
The corresponding figures for northern Germany shew a much lower proportion of high quality wheats than that mentioned by Scharnagel (see preceding abstract) for south Germany. New varieties have just been produced by certain breeders however which are claimed to be equal or superior in quality to such wheats as Janetzki and are suitable for the growth conditions of North Germany. The proportions in which the different varieties were sent in, and the relative quality of the different varieties are described. The results confirm the superior quality of Janetzki, another variety receiving high marks being Svalöfs Extra Kolben spring wheat.

1229. SCHARNAGEL, T. 633.11:664.641.016(43)
Bedeutungsvolle Zusammenhänge zwischen der Mahl- und Backfähigkeit verschiedener Weizensorten (Rassen). [**Important correlations between the milling and baking quality of different wheat varieties** (**races**).]
Z. ges. Getreidew. 1935 : **22** : 13–24.
The milling and baking values of a number of the best known Bavarian wheat varieties over the period 1931–1933 are given, supplemented by other data on a larger number of varieties taken from all over Germany. In spite of differences in place of origin the varietal differences remained more or less constant. The same applied to the varieties after different treatments of the flour before baking. Both the milling and the baking quality are primarily determined by the hereditary constitution of the variety and it is urged that due attention be given to this factor in industrial judgments of the value of a flour.

1230. LAROSE, E. 633.11:664.641.016(49.3)
La valeur boulangère des froments. L'importance de la question pour la Belgique. (**The baking value of wheats. The importance of the question for Belgium**).
Ann. Gembl. 1936 : **42** : 77–140.
The first part of this paper deals with a description of the grain, its anatomical and chemical composition and its nutritive value. Baking value is then defined and the factors controlling it, the various techniques for determining it and causes of variation are discussed. Finally the causes of variation in baking value and the importance of this property in the cereals cultivated in Belgium are considered. A bibliography of 98 references concludes the article.

1231. IWANOFF, I. and CHRISTOFF, J. 633.11:664.641.016(49.7)
(**Bulgarian wheat, grain, flour and baking qualities, 1930/31 harvest**).
Annu. Univ. Sofia V. Fac. Agron. Sylvicult. 1933/34 : **12** : 407–86.
Two new varieties, Nos. 14 and 16, were included in the tests. These have been developed by selection from land races of the common wheat and were found to be equal to it, and in some respects better, in grain and baking qualities. Since they are more productive their distribution is considered desirable.

1232. Boerger, A. 633.11:664.641.016:575(82)
Argentiniens Weizenstandardisierung und die Qualitätszüchtung. (**Standardization of wheat and breeding for quality in Argentina**).
Züchter 1936 : **8** : 57–65.
The new laws introduced in the Argentine Republic for ensuring a uniform and high quality in the wheat shipments made from that country are discussed. The Republic is divided into three sections, in each of which a different type of wheat is to be grown, hard, semi-hard and soft. The varieties admitted under each of these three headings are enumerated and the passages in the law relating to the role of plant breeding in the attainment of the desired improvement are reproduced in a German translation. The author points out with special emphasis that such laws would not have been possible but for the successful work of the local wheat breeders in the last few years and furthermore that the laws make it necessary that this work be carried on with even more precision and care, each breeder directing his whole attention to the production of new and improved varieties of the type laid down by the commission for the zone for which his work is designed.

1233. Uspenskii. 633.11:664.641.016:578.081:575
(**The methods of testing baking quality in wheat flours for breeding purposes**).
Zapiski Voronežskogo Sel'skokhozjaistvennogo Instituta (Trans. Voronesh Agric. Inst.) 1935 : **1** (16) : 145–53.
An examination of a large number of wheat varieties shewed that none of the varieties with the highest baking value were sufficiently hardy and none of the hardiest varieties were of suitable quality. However, among the medium quality varieties both very hardy and very tender ones appear and these two qualities do not in reality appear to be incompatible. For the benefit of breeders a modified form of the Saunders method of estimating baking quality is described. The various factors influencing leaf quality are discussed and many of the more recent methods for determining quality in a dough are described.
A method evolved by Dumanskii in the U.S.S.R., consisting in the refractometric determination of the degree of hydration of the dough, was tried on a number of Soviet wheat varieties and for all *T. vulgare* varieties gave a very close agreement with the baking tests. The variety Ukrainka was the best, followed by the winter wheat *hostianum* 237 and the spring variety *caesium* 111. The method seems promising and further tests are to be made with it.

1234. Boeuf, F. 633.11.00.14(61.1)
Enseignements d'ordre général à tirer des travaux du Laboratoire de Technologie du blé pendant la campagne 1934–35. (**General lessons to be drawn from the work of the "Laboratoire de Technologie du blé" during the period 1934–35**).
Tunisie Agric. 1935 : **36** : 69–72.
The value of the guarantee of the quality of the flour given by the extensimeter indices is discussed and a plea is put forward for the better standardization of the wheats grown in the locality.

## OATS 633.13

1235. Nishiyama, I. 633.13:575.127.2:575.113.7
[**Balanced lethals in *Avena*. (A preliminary note).**]
Jap. J. Genet. 1936 : **12** : 41–42.
A genetic analysis has been made of the $F_2$ segregating albinos in a pedigree ($2n = 14$) derived from a triploid hybrid of *Avena barbata* ($n = 14$) x *A. strigosa* ($n = 7$), by crosses between heterozygous green plants and homozygous green. It is concluded that for the heterozygote the formula is *lG.Lg* and the normal plant is *LG.LG* (*l* being a lethal and *g* the albino factor). On crossing the normal with the heterozygote two types *LG.lG* and *LG.Lg* are formed.
Two possible interpretations of the origin of balance lethals are offered : (1) gene mutation and (2) a special re-arrangement of the chromosomes in both the parents of triploid hybrids ; but no definite conclusion can be reached at present. (Cf. " Plant Breeding Abstracts," Vol. II, Abst. 234).

1236. COFFMAN, F. A. and TAYLOR, J. W. 633.13 Fulghum : 575.242
**Widespread occurrence and origin of fatuoids in Fulghum oats.**
J. Agric. Res. 1936 : **52** : 123–31.

Only 0·19 per cent of over 100,000 individual seeds or plants of the variety Fulghum from 17 of the United States were fatuoids, shewing that fatuoids are not likely to be of any importance as weeds.

In lines of Fulghum selfed for four generations about 0·2 per cent of fatuoids occurred. The origin thus appears to be by mutation, in each case to the intermediate form, giving 3 normal : 1 fatuoid in the next generation ; theoretically mutation to the intermediate form occurred once in 125 individuals.

The Fulghum fatuoid breeds true when self-pollinated, but has rather strong tendency to be cross-pollinated, 47 per cent crossing having occurred in one season, with an average of 11·6 per cent over 5 seasons. Fulghum fatuoids of the common or A type are slightly less vigorous than normal Fulghum plants.

1237. RASMUSSEN, K. J. 633.13:581.4:575
Undersøgelser over morfologiske sortskendetegn hos havre før skridning 1927–1934. (**Investigations on the morphological characteristics of oat plants before earing, 1927–1934**).
K. VetHøjsk. Aarsskr. 1936 : 1–48.

Pot experiments on 46 strains, mainly Scandinavian, with 650–800 plants of each variety and also a number of single plant progenies were carried out in an unheated greenhouse. It appeared that the strains could be grouped in three classes according to the colour of the grain ; while within these groups the strains could be identified by the occurrence, distribution and length of hairs on the leaves and sheaths and at the nodes, studied in conjunction with the dentation of the leaf margin and in some cases with the anthocyanin colouring of the leaf sheaths.

1238. 633.13–2.451.2–1.521.6
REED, G. M. and STANTON, T. R. 632.451.2:576.16
**Reaction of oat varieties to physiologic races of loose and covered smuts of red oats.**
J. Agric. Res. 1936 : **52** : 1–15.

In all 34 varieties or strains of different *Avena* species were used in the tests. Their reactions to 5 collections of *Ustilago levis* and 9 collections of *Ustilago avenae*, mainly obtained from Fulghum or closely related varieties, indicate that the collections are highly specialized in pathogenicity. Evidence of specialized sub-races was obtained in both cases.

Collections of *U. avenae* from Red Rustproof or the related variety Nortex proved to belong to a distinct race, resistance to which was shewn by Fulghum and all other varieties except Canadian (*A. sativa*) and the strains of *A. strigosa* and *A. fatua* used.

The varieties Markton and Novarro, were resistant to all the collections used, while Black Mesdag was found to be susceptible to collections of *U. levis* from Fulghum.

1239. 633.13–2.452–1.521.6
MURPHY, H. C. 633.13–2.451.2–1.521.6
**Reaction of the Victoria oat variety to crown rust.**
Phytopathology 1936 : **26** : 396–97. (Abst.)

The occurrence in the variety Victoria of lines susceptible to different forms of crown rust (*Puccinia coronata avenae*) is reported. There is evidence that lines susceptible to smut (*Ustilago avenae* and *U. levis*) may also occur. It is therefore important that only pure lines whose reactions to crown rust and smut have been tested should be used in crosses.

Apart from such lines, Victoria has in the writer's experience been resistant to all collections of smut and to 37 physiological forms of crown rust and though an undesirable variety from an agronomic point of view is to plant breeders a valuable source of resistance to these diseases.

## RYE 633.14

1240. Breslavetz, L. P., 633.14:575.24:537.531
Medwedewa, G. B. and Afanassjewa, A. S. 633.14:581.03
Die Wirkung der Röntgenstrahlen auf Roggen. (**The effect of X-rays on rye**).
Protoplasma 1935 : **23** : 520–33.

The effect of ray doses of varying strength upon young rye seedlings was observed. In the plants from certain dosages the ears were notably larger than in the normals, other dosages gave negative or undetectable effects ; the most favourable dose in this respect was 250r., which more than doubled the number of ears and the number and weight of grains per plant ; higher dosages had a depressing effect.

Cytological examinations were made on the roots of a number of normal plants, and then upon the X-rayed plants. Among other abnormalities observed were the discharge of the nucleolus into the cytoplasm, and a considerable increase in the number of cells having two nuclei, by the union of which tetraploid cells frequently arose. The second nucleus might be equal in size to the main nucleus or in varying degrees smaller. Clear cases of its origin by budding from the main nucleus are described and illustrated. Various anomalies of division were also observed, including numerous fusions of individual chromosomes and occasionally of the whole chromatin into one large ball. The tendency to increase the quantity of nuclear material was most pronounced with the lower dosages and is thought to be connected with the greater yielding capacity of these plants. With increasing dosage the degree of the other irregularities gradually increased while the number of polyploid and binuclear cells, together with the rapidity of cell division, was reduced.

## MAIZE 633.15

1241. Lecat, P. 633.15:575(44)
L'amélioration du maïs dans le Sud-Ouest. (**The improvement of maize in the South West**).
Sélectionneur 1935 : **4** : Fasc. 3–4 : 17–23.

Maize breeding in South Western France proceeded along more or less empirical lines until—after the International Maize Congress held at Pau in 1930—the Station de Génétique et de Culture du Maïs du Sud-Ouest was founded. The work of this station is for the time being concentrated on the problems of earliness and yield, the object being to combine the earliness of certain Polish and Czechoslovakian varieties with the vegetative qualities and yield of the local types of maize. Attention is directed at present to the preliminary work of purifying the local red and white varieties by pedigree mass selection and also of establishing a collection of foreign varieties of the desired type and adapted to the conditions in France, and these are to be used to produce fixed hybrids and hybrids of commercial value though not breeding true.

1242. Kempton, J. H. 633.15:575.11:581.331.2.02
**Modification of a Mendelian ratio in maize by pollen treatments.**
J. Agric. Res. 1936 : **52** : 81–121.

Studies were made on the effect of different treatments of pollen of *Wx wx* plants on the relative proportions of waxy (*wx*) and horny (*Wx*) pollen grains which effect fertilization.

The results in general were very erratic and often apparently inconsistent, but it was found that exposure to light combined with high temperature, e.g. by exposure to sunlight, could bring about an increase in the proportion of waxy grains which functioned.

Other treatments from which evidence was obtained of a change in the proportions of the two types of grain were storage in the dark at high temperatures, mixing the pollen from different plants and storage for 24 hours in the dark at room temperature.

Pollen samples from different plants reacted differently to the several treatments and in one case definite evidence was obtained of an effect of the female parent (i.e. the plant pollinated) on the behaviour of pollen grains subjected to storage.

No differences in size, weight or specific gravity were found between the two types of grain.

1243. Ashby, E. 633.15:575.125
**Hybrid vigor in maize.**
Amer. Nat. 1936 : **70** : 179–81.
A defence of the author's position (Cf. " Plant Breeding Abstracts," Vol. III, Abst. 148) and a criticism of the conclusions of Lindstrom (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 171). It is emphasized that heterosis, unaccompanied by a growth rate greater than the parental rates, occurs in the period of growth between germination and the onset of flowering and that this cannot be explained by what happens at later stages in the cycle.
Lindstrom's experiments involving the cutting of leaves above the growing point are described as irrelevant as this does not affect the " capital " in the sense that the author used the term, namely, the number of cells in the primordium.

1244. Johnson, I. J. and Hayes, H. K. 633.15:575.127:578.081
**The combining ability of inbred lines of Golden Bantam sweet corn.**
J. Amer. Soc. Agron. 1936 : **28** : 246–52.
A study to determine the reliability of top crosses as a means of determining the combining ability of inbred lines of sweet corn and also the relation between certain characters of inbred lines and the yield of their top crosses.
In all, 39 inbred lines were used and were crossed with the parental open-pollinated Golden Bantam variety, with the open-pollinated variety Del Maiz and with a single Del Maiz inbred line. The fifty-five possible single crosses between eleven of the inbred lines were also made.
Fairly high positive correlations of approximately equal magnitude were obtained on the one hand between the yields of the fifty-five single crosses and the average top cross yield of the two parents and on the other hand between the yields of the single crosses and the average yield of its two parents in nine other single crosses. There was also a high correlation between the average yield of the eleven lines in their ten single crosses and their top cross yields. It thus appears that the top cross method is not significantly inferior to the use of tester lines in determining the combining ability of inbred lines. Further evidence on this point was obtained by dividing the eleven inbred lines into four groups on a basis of their top cross yields, when it was found that single crosses between lines of the higher groups gave on the average higher yields than those between lines of the lower groups.
The data on the respective merits of the related (Golden Bantam) and the unrelated (Del Maiz) varieties in top crosses from the point of view of determining combining ability did not give significant results. The single Del Maiz inbred line proved to be unsatisfactory in this respect.
The simple and partial correlation coefficients between seven characters of all the inbred lines and their top cross yields were determined. The partial correlations holding the other six characters constant, were positive and significant in the cases of ear length and stalk diameter and negative and significant in the case of number of tillers per plant.
The last named character, however, shewed no association with combining ability when studied in the fifty-five single crosses.

1245. 633.15:575.25.061.6
Jones, D. F. 633.15:575.25:581.14
**Segregation of color and growth-regulating genes in somatic tissue of maize.**
Proc. Nat. Acad. Sci., Wash. 1936 : **22** : 163-66.
In purple aleurone with the genetical composition *ccC* white patches often occur, due to the loss of the dominant gene. These mosaic areas are in many cases accompanied by a patch which is darker in colour than the surrounding aleurone, having apparently gained the one *C* gene that was lost by the uncoloured area ; the two areas are in some cases unequal. Similar paired stripes have been found in the pericarp, resulting from a transfer of the pericarp colour gene *P*.
In most progenies which shew these colour mosaics, similar changes in respect of growth rates occur, in the form of depressed areas or cavities and outgrowths ; sometimes the two types occur as paired mosaics. Both depressed and raised areas have been found adjoining or coinciding with colour changes. Changes in cell size sometimes accompany the production of darker cells and also occur alone.
The different methods by which these somatic segregations can arise are briefly discussed.

1246. GARBER, R. J., 633.15:581.46:575.113
DUSTMAN, R. B. and BURNHAM, C. R. 633.15–1.557:581.192
**Yield and composition of eared and earless maize plants in a selfed line segregating barren stalks.**
J. Amer. Soc. Agron. 1936 : **28** : 85–91.

Certain earless plants appearing in selfed lines of Boone County White maize were analysed chemically and the results compared with those obtained from their normal sibs. The two types of plant were also compared as to yield.

It was found that the weight of entire plant at the proper state of maturity for ensilage was greater in the case of the normal plants but that the weight of stem and leaves was greater in the earless plants.

The entire normal plants contained less sugar and more starch than the earless plants and a similar relation existed between the leaves of the two types ; in total carbohydrates the normal plants had the higher percentage, but the earless plants had a somewhat greater percentage of crude protein and crude fibre.

The character earless was apparently due to a single recessive gene and it is pointed out that this gene has a profound influence on growth and development.

1247. 633.15–2.183–1.521.6:575.11
OVERBEEK, J. VAN 633.15:581.143.031
**"Lazy," an a-geotropic form of maize. "Gravitational indifference" rather than structural weakness accounts for prostrate growth-habit of this form.**
J. Hered. 1936 : **27** : 93–96.

Evidence is presented to shew that except for young plants in the dark, maize homozygous for the gene "lazy" is ageotropic and it is considered that this is the chief cause of its prostrate habit of growth in the field (Cf. "Plant Breeding Abstracts," Vol. II, Abst. 85).

1248. 633.15–2.3–1.521.6:581.44
WELLHAUSEN, E. J. 635.67–2.3–1.521.6:581.44
**Histological changes in resistant and susceptible strains of maize infected with *Phytomonas stewarti*.**
Phytopathology 1936 : **26** : 112–13. (Abst.)

Observations were made on the reaction of the vascular bundle to bacterial invasion in inbred lines of maize and sweet corn differing in degree of resistance.

In highly resistant lines the morphology of the bundle was not changed, relatively few bundles shewed infection and rarely were more than one or two vessels plugged. In moderately susceptible lines, an apparent attempt was made to isolate the point of infection in the protoxylem by increased cell division and subsequent lignification ; meanwhile, however, plugging of vessels and tracheids occurred, resulting in the slow death of the plant. In very susceptible lines rapid plugging of the vessels and deterioration of parenchyma cells followed infection, in some cases the entire bundle being destroyed. These lines wilted shortly after inoculation and it appears that invasion is so rapid that destruction occurs before the plant can respond by counteractive measures.

1249. SMITH, F. L. 633.15–2.451.2–1.521.6:575
**The effect of corn smut on the yield of grain in the San Joaquin Valley of California.**
J. Amer. Soc. Agron. 1936 : **28** : 257–65.

After giving data to shew the losses in yield due to *Ustilago zeae* (Beckm.) Ung., the author states that the investigation is part of a maize breeding programme in which an attempt is being made to reduce losses by breeding methods.

1250. JOHANN, H. 633.15–2.482–1.521.6:581.48
**Histology of the caryopsis of yellow dent corn, with reference to resistance and susceptibility to kernel rots.**
J. Agric. Res. 1935 : **51** : 855–83.

No anatomical features were observed sufficient in themselves to account for the differences in resistance to invasion by *Diplodia zeae* (Schw.) Lév. The rate of formation of the closing layer of the hilar orifice, however, appeared to be correlated to some extent with resistance and from the anatomical point of view appears to bear some relation to the advance of the fungus into the kernel.

It is considered however that more importance is to be attached to chemical than to anatomical differences between the different lines in relation to differences in resistance.

## BARLEY 633.16

1251. EULER, H. v. and WEICHERT, R. 633.16:575.242.061.6:581.192
Zur Biochemie chlorophylldefekter Gerstenmutanten. (**The biochemistry of chlorophyll deficient barley mutants**).
Svensk Kem. Tidskr. 1934 : No. 12 : 301–06.

Chemical investigations were made on three new Primus II mutants obtained from Nilsson-Ehle, of the types Gulvit, Xanthalba and Xanthaurea, and on an X-ray mutant from the same source. The two first-mentioned had slightly lower catalase contents than the normal, though more than Albina 1. The X-ray mutant had 100 per cent more dehydrase than the normal, the other mutants shewing no difference in this respect.

1252. EULER, H. v., BERGMAN, B., 633.16:575.242.061.6:581.192
HELLSTRÖM, H. and BURSTRÖM, D. 633.16:575.242.061.6:581.174
Konstanz des Chlorophyllgehaltes und Chromatophorendegeneration chlorophyllmutierender Gerstensippen. (**Constancy of the chlorophyll content and plastid degeneration in chlorophyll mutant lines of barley**).
Hereditas, Lund 1936 : **21** : 119–28.

About 100 grains of each of the barley lines Röntgengoldgerste I and Röntgengoldgerste II were germinated and the chlorophyll content of the seedling leaves of the different individuals determined. Röntgengoldgerste I segregates into 3 green : 1 white while Röntgengoldgerste II segregates into 3 green : 1 yellow-green.

From a statistical analysis of the results it was concluded that there was no evidence to demonstrate a difference in chlorophyll content between green homozygotes and heterozygotes in either case.

The chloroplasts of five chlorophyll-defective mutants were investigated. In Röntgen-mutation I (white) and Primus II " yellowish-white " they were small and degenerate with white spots in some (Cf. " Plant Breeding Abstracts," Vol. IV, Abst. 159), while in Primus II Xanthaurea, Primus II Xanthalba and Röntgen-mutation II they were more nearly normal in form and size.

1253. 633.16–2.452–1.521.6
JOHNSTON, C. O. 633.11–2.452
**Reaction of certain varieties and species of the genus *Hordeum* to leaf rust of wheat *Puccinia triticina*.**
Phytopathology 1936 : **26** : 235–45.

The seedling response of several cultivated varieties and wild forms of *Hordeum* to leaf rust of wheat was tested and it was found that though none was fully susceptible many allowed a copious production of small uredia. Little difference in the reaction of a given variety to different physiological forms was observed.

The correlation, if any, between chromosome number and susceptibility was negative, the reverse of that obtaining in *Triticum*.

1254. Rennerfelt, E. 633.16–2.452–1.521.6(48.5)
Iakttagelser över dvärgrost (*Puccinia simplex*, Eriksson et Henn.) på korn. **[Observations on dwarf rust (*P. simplex* Eriksson et Henn.) on barley].**
Sverig. Utsädesfören. Tidskr. 1935 : **45** : 380–91.
The results of observations on the resistance of a number of varieties and hybrids to dwarf rust are tabulated.

1255. Thunaeus, H. and Schröderheim, J. 633.16:663.421:575(48.5)
Ueber die Sorteneigenschaften der Braugerste. Erfahrungen aus den schwedischen Braugerstenversuchen 1926–1934. **(Varietal characters of Swedish brewing barleys. Experience from the Swedish investigations of 1926–1934).**
Wschr. Brau. 1935 : **52** : 357–62, 369–73.
The Swedish experiments have shewn that the variety is of primary importance in its influence on the quality of the malt, often much more so than the growth condition, weather, etc. A brief review is given of the breeding of the best and most productive barley varieties in Sweden and Denmark, where the new varieties of the Gold type have now entirely replaced all others. Exhaustive tests made in Sweden over a number of years on the productivity combined with the results of analysis for the various factors are described, from which it is seen that varieties such as Chevalier II and Prinzess, in spite of their excellent quality, are too low in yield and extract to be profitable. Between 1920 and 1930 Gold barley was definitely the best. Sieger was superior in yield and standing capacity but owing to a deficient permeability of the testa was delayed in germination, which seriously affected the malt and prevented this variety from gaining popularity. The variety Binder however excelled Gold in yield whilst possessing the high quality of the weak strawed varieties and an unusually high extraction. Introduced in 1928, by 1930 this variety had gained the ascendant. Danish hybrids between Binder and Gold gave still higher yields. Two of these, namely Opal and Kenia also equalled Binder in quality and extraction, Kenia gave yields of 4,500 kg. per ha. in 1933. It is the strongest strawed *nutans* barley yet known and has now almost replaced all others. From Opal, selections of the best plants from an agricultural point of view were made and then subjected to analysis by the brewers. In this way a further improved line Opal B, was produced.
Another Danish variety Maja, from the same cross, is also highly promising. Isaria, though possessing unusually high extraction, is weaker in the straw and has been discarded for this reason.
Other quality factors, such as solubility of protein, rate of solution, amylase content, etc. are given for these varieties and shewn to be characteristic for each variety. In spite of their genetic relationship, Kenia and Opal differ sharply in amylase content, the former being classed as rich and the latter poor. In solubility of protein Binder came highest.

## MILLETS AND SORGHUMS 633.17

1256. Woodworth, C. M. 633.174:581.44:575.113.4.061.6
**Inheritance of seedling stem color in a broomcorn-sorghum cross.**
J. Amer. Soc. Agron. 1936 : **28** : 325–27.
In the $F_2$ of a cross between the grain sorghum Shallu and Black Spanish broomcorn segregation for stem colour in the ratio 9 red : 7 green was observed, suggesting the occurrence of complementary factors, an hypothesis which was confirmed by the segregation of the $F_3$ progenies from red-stemmed plants.

1257. 633.174–2.411.4–1.521.6:575(78.1)
Elliott, C., Melchers, L. E., Lefebvre, C. L. and Wagner, F. A.
***Pythium* root rot of Milo.**
Phytopathology 1936 : **26** : p. 92. (Abst.)
A root rot affecting certain strains of milo varieties has been identified as *Phythium arrhenomanes* and has been found to be soil-borne. Resistant strains have been developed from susceptible types of milo varieties. The kafir and sorgo varieties tested have proved immune.

1258. 633.174–2.7–1.521.6
633.62–2.7–1.521.6

Hsu, T. S.

**Resistance of sorghum to stem borers.**

J. Amer. Soc. Agron. 1936 : **28** : 271–78.

The infestation of a large number of strains and varieties of sorghum by stem borers such as *Pyrausta nubilalis* and *Diatraea diatraea* was studied in 1933 and an analysis of variance shewed that there were significant varietal differences. In 1934 selections of strains and varieties of sorghum that were classed as resistant and susceptible in 1933 were tested again, together with six varieties of sorgo, and again significant varietal differences were found.

A significant positive correlation was obtained between the results obtained in the two years with 13 of the strains ; on the other hand an analysis of variance for the two years' results shewed a significant interaction of varieties with years.

Controlled infestation experiments indicated that sorgos suffered worst, next the strains which were heavily infested in 1933 and last those which appeared resistant in 1933.

Significant associations were found between infestation on the one hand and grain colour and plant height on the other in both 1933 and 1934, white and pink-grained varieties being less infested than those with yellow or red grains and shorter varieties less than the taller. Stiffness of stalk shewed an association in 1934 but not in 1933.

## RICE 633.18

1259. Suzuki, S. and Masamune, G. 633.18 *O. formosana*

**A new wild species of rice plant in Taiwan.**

Trans. Nat. Hist. Soc. Formosa 1935 : **25** : p. 320.

A new species named *Oryza formosana* Masamune et Suzuki is described in Latin.

1260. 633.18:575(51)
633.18–1.421

Chao, L. F.

**(The principles and practice of rice breeding).**

J. Agric. Ass. China 1933 : **114** : 1–52.

This article is a summary of methods used in and of results evolved from the author's own work in rice breeding conducted at the National Central University, Nanking, China. For field technique in rice breeding the following points have been suggested :

(1) Direct planting, rather than transplanting, is preferred as being easier and also providing more uniform environmental conditions for seedling growth, thus lessening the variability of the later development of the plants. The fact that varieties planted directly do not differ in yield from those transplanted further supports the above practice.

(2) Row length of 16 Chinese feet,* row distance of 1·5 Chinese feet and three rows in each plot are the plot size recommended for accurate yield tests. The author calculated the coefficients of variability and their probable error from different row lengths of 4, 8, 12, 16, 20, 24 or 28 Chinese ft. and from different plot widths with 1, 3, 5, 7 or 9 rows in each plot and tested the significance of the differences between various coefficients by means of their probable errors. Row distance below 1·5 Chinese ft. is not favoured as it does not provide enough space for field work after planting.

(3) Too many replications (e.g. ten times), would not reduce the probable error to such an extent as to compensate for the labour and the land used.

(4) Seed rate of 12 grammes per row is favoured.

A great portion of the article deals with the details of the method of pure line selection as used in the National Central University. Modified statistical methods and significance levels have been devised as a means of eliminating lines inferior in yielding capacity. Standards for selecting heads, methods of conducting trials for head rows, two rod-rows, five rod-rows, ten rod-rows, advanced test and regional test, of field arrangement and observation, and the scheme of planting, taking field notes and recording yield data are fully described.

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* 1 Chinese foot = $\frac{1}{3}$ meter.

Hybridization as a means of improving the rice crop is discussed. As soon as the panicle begins to shoot all the spikelets at the lower part are cut off, leaving 14–15 spikelets at the top, which will bloom within one day. Pollination should be practised within 24 hours, and if delayed, not more than 4 days after emasculation ; if pollinated between 9 a.m.—12 a.m., a higher percentage of fertile seeds could be secured. Methods of handling $F_1$ seeds and seeds of subsequent generations are described.
A plan for steps which should be taken to improve the rice crop in China is formulated and includes : (1) large scale variety trials (2) regional tests of improved varieties and (3) collection and classification of Chinese varieties of rice. P.C.M.

1261. 633.18:575(76.3)
633.00.14

**Biennial Report of the Rice Experiment Station Crowley, Louisiana, for the years 1933–1934.**

La Univ. Agric. Exp. Sta. 1933/34 : Pp. 34.

The varietal improvement work of the station was extended in 1932 to include the production of better varieties by hybridization ; selection and variety trials also form part of the work. Lines from 25 crosses have been obtained from the United States Department of Agriculture and tested while many crosses have been made on the station. As many combinations as possible are being made to determine which hold out most promise for progress.
An attempt is being made to improve the method of cross pollination. A study of natural crossing has indicated that it is too small in amount to handicap seriously the maintenance of purity of selections grown side by side.
The mode of inheritance of various characters is being studied and it has been found that the resistance of the variety Rexoro to " white tip " is probably due to a single gene.
Variations have also been noted between varieties and hybrid lines in resistance to *Helminthosporium* leaf spot and selections have been made from the more resistant of the latter.
Work with other crops includes varietal trials with cotton, maize, grain and fodder sorghums and soya beans and investigations have been made on varietal control of insect pests of the soya bean and *Crotalaria*.

1262. 633.18:575.42(67.5)

La sélection du riz à Yangambi. (**Rice selection at Yangambi**).

Agric. Elev. Congo Belge 1936 : **10** : p. 15.

Rice from the Congo and foreign countries is undergoing selection, and 600 lines have been isolated from about 60 varieties. Inferior lines are eliminated each year and from 300–400 new lines are included in the trials. For the past year seed obtained from mass selection has already been distributed.

1263. 633.18:576.356.5
581.162.5:576.354.46

MORINAGA, T. and FUKUSHIMA, E.

**[Observations on the autotetraploid rice plants. (A preliminary note).]**

Jap. J. Genet. 1936 : **12** : p. 59.

Autotetraploids were found on six occasions in highly sterile strains of rice.
The length of the stem was 70–80 per cent of that of the diploid. The ears on the other hand, were longer than those of the diploid, but shewed greatly reduced fertility and though the anthers and pollen of the tetraploids were larger than those of diploids, only about 50 per cent of the pollen was perfect.
In pollen mother cells 8 and 9 tetravalents were observed at diakinesis and metaphase I respectively, the remaining chromosomes forming bivalents. In the megaspore mother cell 9 tetravalents were usually observed.

1264. GAGOLINAN, V. 633.18:581.44:575.42
**A study of variability and the possibility of isolating Apostol rice strains with strong rachillae.**
Philipp. Agric. 1936 : **24** : 659–77.
One of the leading varieties of rice (*Oryza sativa*) in the Philippines is Apostol or Inapostol. Its cooking quality and yield are very good but it has the defect of weak panicle branches or rachillae. Experiments to isolate strains without this defect shewed that mass selection for strong rachillae was followed by a considerable reduction in the number of plants with weak rachillae. The high correlation found between the number of bearing culms and the number of panicles with strong rachilla should be of use in selecting this latter character.

1265. ONODERA, J. 633.18–2.112–1.521.6:578.081.1:575
**(Varietal types of adaptation for drought in rice plant).**
Proc. Crop Sci. Soc. Japan 1936 : **8** : 3–40.
Physiological characteristics pertaining to various cell sap reactions in rice, and indicating certain types of adaptation to drought are described. On the basis of his experimental work the author holds that the various aspects of drought resistance as a whole may be estimated by a simple morphological criterion, namely, the height of the plant grown in non-saturated conditions of soil compared with the height in water-saturated conditions or in other words the relative heights under upland and under lowland conditions.
In experimental cultures varietal differences in various physiological responses were observed. Judging from field experiments the above-metioned height ratio may be a good practical method of determining drought resistance in varieties.

1266. TULLIS, E. C. and CRALLEY, E. M. 633.18–2.191–1.521.6(73)
**Chlorosis of rice induced by iron deficiency.**
Phytopathology 1936 : **26** : p. 111. (Abst.)
A type of chlorosis occurring in Arkansas, Louisiana and Texas has been found to be due to a deficiency of iron in the plants. Most commercial varieties now grown, except Rexoro and Fortuna, are susceptible, differences in varietal susceptibility being very marked.

## LEGUMINOUS FORAGE PLANTS 633.3

1267. HACKBARTH, J. 633.367:581.143.26.035.1
Versuche über Photoperiodismus III. Die Photoperiodische Reaktionsweise einiger Lupinenarten. **(Researches on photoperiodism III. The photoperiod reaction of some lupin species).**
Züchter 1936 : **8** : 81–92.
The species used included *L. luteus*, *L. angustifoluis*, *L. albus* and *L. mutabilis*. The investigations were made in 1934, when the plants suffered much from drought, and in 1935. In a number of cases the results for the two years were completely contradictory and it is suggested that the temperature and humidity may have at least as great an effect as length of day.

1268. 633.367:581.192.6:575.1
SENGBUSCH, R. v. 633.367:575.173
Probleme der Süsslupinenzüchtung. **(Problems of sweet lupin breeding).**
Forschungsdienst 1936 : **1** : 580–83.
Much of this paper deals with work already referred to (Cf. " Plant Breeding Abstracts," Vol. V, Absts. 717, 1033, Vol. VI, Abst. 916). A number of hypothetical considerations are included on the possible relations between the genes in alkaloid-free types of lupins and the biochemical basis of this condition—for example, the existence of a series of factors corresponding to the various stages of degradation or synthesis of the alkaloids in the different species of lupins.
Future research should concentrate on the discovery of alkaloid-free types which are at the same time normal in other respects such as fertility. Also a thorough study of the genetic basis of the problem should be made while chemical investigations should be directed to elucidating the action of the various genes involved.

1269. SENGBUSCH, R. v. 633.367:581.192.6:581.47
Züchtung von Lupinen mit nichtplatzenden Hülsen? (**Breeding lupins with non-splitting pods?**).
Mitt. Landw. 1935 : **50** : 1113–15.

One of the main obstacles in the cultivation of the sweet lupins is the bursting of the pods, to which both *Lupinus luteus* and *L. angustifolius* are very subject, and selection experiments in the direction of non-splitting pods were started in 1929. However, no such plants were found, though several million plants were examined and it was concluded that the splitting was a composite character. It was found to be influenced by the thickness of the fibrous layer in the fruit and by the difference in wall thickness of the inner and outer cells of this layer ; also by the width of the pod, the strength of the suture and of the attachment to the pedicel. A search was therefore instituted for plants with each of these characters in the desired form and for methods of rapidly determining them. Thus plants with the thinnest fruit walls were selected (round about 0·06 mm.), others with the broadest pods (up to 10 mm.), others with the fruits whose wall requires the minimum force to straighten it when it bends on drying. An apparatus has been designed for measuring each of these characters and is described.
In order to have the greatest possible number of forms from which to select, the wild forms from the home of these lupins, namely the Mediterranean countries, are included in the investigation and X-rays and radium are used to induce mutation ; the hope is still entertained that the desired forms will ultimately be discovered.

1270. 633.367:581.5:575.41
FISCHER, A. and SENGBUSCH, R. v. 633.367:575
Die natürliche Auslese durch geologische und klimatische Verhältnisse in den verschiedenen Teilen der Genzentren und ihre Nutzbarmachung für die Züchtung. (**Natural selection through geological and climatic conditions in the various parts of the gene centres of distribution and its utilization in breeding**).
Biologe 1936 : **5** : 49–55.

Vavilov's theory of gene centres of distribution of plant forms, his work with Bukasov, and that of Baur and Schick on the frost resistant potatoes of Peru and Bolivia, are outlined with observations on the effects of climate in directing natural selection.
The authors' investigations on lupins (already reviewed in " Plant Breeding Abstracts," Vol. VI, Abst. 916) are recorded to demonstrate the importance of geological and climatic conditions as selection factors limiting the field for exploration in the search for new desirable types for breeding purposes. The need for exploratory expeditions to make plant collections is once again emphasized.

## ROOTS AND TUBERS 633.4

1271. 633.416:575.113.3.061.6:575.116.1
KELLER, W. 633.63:575.113.3.061.6:575.116.1
**Inheritance of some major color types in beets.**
J. Agric. Res. 1936 : **52** : 27–38.

The factors studied, occurring in sugar beets and red beets, were $R^t$, $R$, $r$, $Y$, $Y^r$ and $y$, the phenotypes they produce being as follows : $Ry$ red hypocotyl white root, $RY$ red beet, $R^tY^r$ striped red beet, $RY^r$ green top red root, $R^ty$ red top white root, $ry$ yellow hypocotyl white root, $rY^r$ green top yellow root and $^rY$ yellow beet ; a ninth type, pale red beet, also occurred but the difference between this and red beet ($RY$) is not known.
Their behaviour in crosses, in which pollination was controlled by bagging or by isolation, indicated that $R$ is linked to $Y$ with about 7·5 per cent crossing over. Similar linkage with the same amount of crossing over was found between $R^t$ and $Y^r$ and between $R$ and $Y^r$. On this basis it is suggested that $r$, $R$ and $R^t$ form one allelomorphic series while $y$, $Y^r$ and $Y$ form another. $R^t$ is dominant over $R$ and increases pigment development in the top, while $Y$ is dominant to $Y^r$ and increases pigment production in the petioles and leaves as well as causing pigment development in the root.

1272. KÄSEBIER, A. 633.42(47.4)
Uus kodumaa naeri sort " Torma Valge." **(A new Estonian turnip variety " Torma Valge.")**
Agronoomia 1934 : No. 3 : 106–08.
The new variety originated in a field in Mustiala, in Finland. The aim of the selection was to produce a rapid-growing and hardy turnip with a high yield. The breeder considers it to be specially adapted to sandy soils. It is spindle-shaped, of moderate length, with white flesh, white skin, few lateral roots and semi-erect leaves. When tested in 1932 and 1933 at the Experimental Stations at Jõgeva, Raadi and Kuusiku, the yield from Torma Valge as compared with Oestersundom, was especially high at Kuusiku, where the soil conditions were less favourable than at Raadi and Jõgeva. **M.P.**

1273. 633.42–2.411.1–1.521.6:575
635.34–2.411.1–1.521.6
WALKER, J. C. 635.44–2.411.1–1.521.6
**Resistance to club root in *Brassica*.**
Phytopathology 1936 : **26** : p. 112. (Abst.)
In greenhouse trials with infected soil only 3 out of 2,600 cabbage plants, representing 25 varieties, remained free from infection by *Plasmodiophora brassicae*.
In turnips, Shogoin consistently gave 100 per cent infected plants while Snowball, Purple Top Milan and White Milan were consistently free from infection, other varieties giving varying percentages of infection.
Most rutabaga (*B. napobrassica*) varieties were free from infection, while great variation was observed in the resistance of American and European strains of white and black mustards.
The $F_1$ of a cross between Snowball and Shogoin turnip varieties consisted of 441 resistant and 22 susceptible plants.

1274. SNELL, K. 633.491
Auch Kartoffelsorten haben ihre Geschichte ! **(Potato varieties also have their history!)**
Die Kartoffel 1934 : **14** : 28–29.
Indication is given of a number of varieties which have been received under a variety of synonymous names, either identical or in the form of colour mutants or other variants.

1275. 633.491 Katahdin
633.491 Chippewa
633.491 Golden
CLARK, C. F. and STEVENSON, F. J. 633.491–2.8–1.521.6:575(73)
**The Katahdin, Chippewa, and Golden potatoes.**
Circ. U.S. Dep. Agric. 1935 : No. 374 : Pp. 12
The Katahdin potato, which was bred for resistance to the virus disease, mild mosaic, arose from a cross between U.S.D.A. seedling no. 24642 (from Sutton Flourball x Aroostook Wonder) and U.S.D.A. seedling no. 40568 (from Busola x Rural New Yorker No. 2). It is a late maturing variety with the capacity under some conditions of setting its tubers comparatively early, highly resistant to mild mosaic but not to spindle tuber or leaf roll. Its cooking quality ranges from fair to very good according to the conditions of cultivation and it gives a satisfactory yield of good-sized, short, elliptical to roundish smooth tubers with flesh commercially classed as white. Tests have indicated that it will partly replace the standard varieties in certain sections of Michigan, Iowa, New Jersey, Oregon, northern Idaho and the higher altitudes of Colorado. Its pollen is medium to abundant and of good quality.
Chippewa arose from the same cross as Katahdin, to which it is very similar. Its tubers are slightly longer in relation to their width than those of Katahdin and mature considerably earlier, though the variety is still classed as late. Though it has not been tested as extensively as

Katahdin, Chippewa appears to have a wide range of adaptability and is likely to be commercially important in Michigan and other states where similar conditions prevail. It is resistant to mild mosaic but not to leaf roll or spindle tuber and its pollen is scant and poor.
The yellow fleshed variety Golden has a considerably more complex pedigree than Katahdin and Chippewa ; in addition to the four commercial varieties participating in the origin of the latter two varieties, the variety Majestic, an unnamed variety from Costa Rica and an unknown variety were concerned. The variety Golden is late-maturing, producing large yields of medium-sized roundish tubers ranking high in cooking quality. Tests have indicated that its range of adaptation is less than that of the other two varieties ; it is particularly well adapted to northern Maine. Its pollen is described as scant and poor and its reaction to virus diseases is not mentioned. (See also " Plant Breeding Abstracts " Vol. IV, Abst. 1021.)

1276. Clark, C. F. 633.491:575
**Report of the Research Committee on potato breeding.**
Amer. Potato J. 1936 : **13** : 96–99.
A review of the relevant papers published in 1935. The individual papers have been reviewed in " Plant Breeding Abstracts."

1277. Stevenson, F. J. 633.491:575(73)
**The national potato breeding program.**
Amer. Potato J. 1936 : **13** : 57–59.
The development of potato breeding and its general trend in the United States is outlined. Among the problems for investigation under the national programme are the nature and inheritance of disease resistance and earliness, sterility and its causes, cooking quality, breeding methods, and cytogenetic studies of hybrids. (Cf. " Plant Breeding Abstracts," Vol. IV, Abst. 717).

1278. 633.491:575:581.6
Tolaas, A. G. 633.491.00.14:578.08
**Determining the value of a new potato variety.**
Amer. Potato J. 1936 : **13** : 60–64.
In determining the value of new varieties such as Katahdin, Chippewa and Warba (Cf. " Plant Breeding Abstracts," Vol. IV, Absts. 1014 and 1021), first local, and then widely distributed trials by numbers of growers in the various states were made in order to test whether the commercial possibilities observed in the breeding plots are realized under the different regional types of conditions.
All breeding material and prospective new varieties are now subjected to inoculation tests for mosaic resistance before being passed on to the growers for field tests.
The cooking quality of the above mentioned three varieties, when grown in Minnesota, has also been determined and Chippewa and Warba have been adjudged better than Katahdin.

1279. Krantz, F. A. and Mattson, H. 633.491:575.11.061.6
**Periderm and cortex color inheritance in the potato.**
J. Agric. Res. 1936 : **52** : 59–64.
Three complementary factors, *E*, *S* and *F* for the production of red colour in the periderm of the tubers are postulated to explain the segregation in the progenies of 11 selfed potato plants, with the additional assumption that in certain cases duplicate factors were also concerned.
Another three complementary factors *C*, *R* and *D* together producing red colour in the cortex, are assumed to explain the inheritance of this character.
Two duplicate factors *P* and *P'* are considered to be concerned in the production of blue in both periderm and cortex, either of them being capable of changing red periderm or cortex to blue.

1280. Asseeva, T. and Blagovidova, M. 633.491:575.252:537.531
**(Artificial mutations in the potato).**
Bull. Appl. Bot. Leningrad 1935 : Ser. A (15) : 81–85.
The effect of X-rays and other agencies in producing vegetative mutations in the tubers was studied on a number of varieties. The various chemical agencies tried had no effect whatever. In the X-rayed material, however, mutations were detected, in some varieties with considerable frequency. Thus in the variety Wohltmann 23 leaf mutations were observed, whilst Epicure on the other hand gave none at all. Some, though not all, of these mutants were analogous with ones already found as natural mutants—e.g. the type with reduced pubescence and the type with warty leaf surface. Variegation, which in natural circumstances is very rare, also occurred, while certain common natural mutations, such as fused leaves, did not appear at all and it seems that the two processes of natural and X-ray mutation are not identical.
Only one tuber mutant was observed, namely white or mottled mutants of Wohltmann, which is also a common natural mutant.
Most of the mutants appeared in the dermatogen, which thus appears to be a particularly labile tissue.
The effects of different types of irradiation are described.

1281. Zapparoli, T. V. 633.491:575.42
Direttive generali per il miglioramento di razza della patata. **(General directions for the improvement of potato races).**
Atti 1a Conveg. Naz. Incremento Prod. Patate, Como 1935 : Pp. 15.
A general discussion of the methods for the improvement of the potato by selection of existing varieties or by natural or artificial pollination and subsequent selection of the progeny. The possibility of obtaining races resistant to virus is also considered.

1282. Nakamura, M. 633.491:576.356.5:576.312.35
**Preliminary note on the polyploidy in *Solanum nigrum* Linn.**
J. Soc. Trop. Agric. Formosa 1935 : **7** : 255-56.
Two forms of *S. nigrum* found in Formosa differ in many features of their vegetative and reproductive organs, and especially in the size of their flowers, fruits and seeds. A study of chromosome behaviour at meiosis in pollen mother cells shewed that one form was diploid (basic number 12) while the other form, with 36 chromosomes in the haploid condition and the large reproductive organs was regarded as an autohexaploid derived from the 12-chromosome form. The latter form is very common in Formosa, whereas the high chromosome type is rare and limited to special localities.

1283. Schwarz, P. A., Kuzmin, S. F. 633.491:581.192.2:575.11
**Investigations of potato in genetic aspect. I. Protein content of certain species and hybrids of potato.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1936 : **1**(X) : 187–90.
Experiments were made with two of the South American species *Solanum Phureja* and *S. Rybinii*, the former having a high protein content of 14·09 per cent and the latter only 5·37 per cent. Systematically the two species are fairly close and their hybrids are self-fertile, both species and hybrids having 24 chromosomes. *S. Phureja* is highly susceptible to virus whilst *S. Rybinii* is resistant.
The hybrids were intermediate or like *S. Phureja* in most characters but more vigorous than either parent. Some of them proved fertile while others were quite sterile. Segregation occurred in $F_2$. As regards protein content some of the $F_1$ hybrids exceeded *S. Phureja*, having 15·68 per cent protein ; others had lower contents, down to 8·53 per cent. This latter form when selfed gave an $F_2$ which also segregated, though not beyond the parental limits. The $F_2$ and back-cross ratios indicate that protein content is conditioned by several genes. It is thought desirable to carry out selection for high protein forms.

1284. RATHLEF, H. v. 633.491–1.524.2(85)
Die Kartoffeln von Peru und ihre Klassifikation. **(The potatoes of Peru and their classification).**
Kühn-Arch. 1936 : **42** : Pp. 31.

A general outline of the individual characters of the potato plant is followed by an attempt to describe the clearly recognizable groups of forms found in samples of potatoes received from Peru and grown under German conditions, the findings being compared with the data of Bukasov and Rybin.

Great variety was found, as might be expected with specimens from Peru where manifold types prevail and the phenotype is in a labile condition and bud mutations are frequent. Even within the groups established great variety prevails and many of the groups themselves are so clearly demarcated that they must be regarded as separate species.

In conclusion the general physiological characteristics, e.g. vegetation period and water requirements under European conditions are outlined.

The material from southern Peru and probably Bolivian forms too are less adapted to European conditions than those from Central and Northern Peru. The wart resistant forms appear to be less adapted to the European climate than the susceptible types ; but the data on this point are insufficient. Forms with blue coloration are better adapted than red forms and very much better than those bearing recessive colour factors.

Types of *S. andigenum* and *S. gonicalyx* are regarded as specially promising material in breeding varieties with good flavour and wart resistance, and at the same time avoiding the evil effects of inbreeding.

1285. 633.491–1.524.4:575(8)
BUKASOV, S. M. and LECHNOVITZ, V. 633.491:575.127.2(47)
Importancia en la fitotecnia de las papas indígenas de la America del sur. **(Importance of the native South American potatoes for plant breeding).**
Rev. Argent. Agron. B. Aires 1935 : **2** : 173–83.

After enlarging upon the value of the South American potato species for purposes of breeding, some of those of most interest are discussed and their behaviour on hybridization is described. The hybrids with *S. demissum* retain the resistance to frost and to *Phytophthora* characteristic of this species but are low in tuber yield. Both the $F_1$s and the best hybrids in the $F_2$ are back-crossed with *S. tuberosum* and the back-cross hybrids are frequently again back-crossed. This however brings about a reduction in the *Phytophthora* resistance.

Other wild species resistant to frost are *S. acaule, S. Millanii, S. Bukasovii* and *S. Commersonii*, as well as three cultivated species *S. Juzepczukii, S. curtilobum* and *S. ajanhuiri*. The most interesting are *S. acaule* and *S. curtilobum* ; the former grows at altitudes of 4,000 and almost 5,000 m., almost up to the snow line and tolerates frosts of —8°C. Its hybrids are also frost-resistant but up to now have proved sterile both in selfings and crossings, as is also the local cultivated species *S. Juzepczukii*, which closely resembles these hybrids and is probably of similar origin. It has been suggested that success might be obtained by first crossing *S. acaule* and *S. demissum* and then crossing the hybrid with *S. tuberosum*.

The locally cultivated species *S. curtilobum* has given very promising results in crosses made by Kovalenko ; some of the hybrids with the European potato have yielded as much as 900 grm. per plant and have starch contents of up to 26 per cent, besides being resistant to frost.

The triple hybrids obtained by mass hybridization of all the above hybrids with Epicure are still more promising, giving yields of 2,500 grm. per plant and over 500 centners per ha.

Most of the South American species are later in maturity than the European potato but the property of immediate sprouting, within a few weeks to one month from lifting the tubers, possessed by *S. Rybinii* and *S. phureja* lends great interest to these two species in connexion with obtaining two yields of tubers per year. The same property is found in *S. boyacense* from Colombia and *S. Kesselbrenneri* from Ecuador. *S. phureja* grows in situations of relatively low elevation and is one of the few potatoes in which tuber formation is not impeded by moist, hot, subtropical conditions. It is characterized by low starch content (8–10 per cent) and very high protein content.

Some of the highest yields are obtained from the hybrids of *S. andigenum* with the European potato, many of which give 2,400 grm. per plant in the first hybrid generation.
With regard to resistance to *Phytophthora*, the discovery of the new species *S. Millanii*, possessed of a high degree of resistance, as shewn by artificial infection, as well as frost resistance, has disproved the assumption that blight-resistant forms occur only in Mexico. *S. Millanii*, belonging to the subsection *Commersoniana*, section *Pinnatisecta*, collective species *S. chacoense*, occurs in the Territorio do Misiones, Loreto, Argentina. It stands closer to *S. Commersonii* than to *S. chacoense*, *S. Commersonii* being also resistant to frost.
The new species *S. Henryi*, from Colonia, Uruguay, is also partly resistant to *Phytophthora*. It is diploid and is considered the primordial form of the triploid *S. Commersonii* which occupies a very restricted area in Montevideo.
Descriptions in Latin and Spanish are given of the two new species, *S. Millanii* and *S. Henryi*, and of a number of their forms.

1286. Schlumberger, O. 633.491–2.4–1.521.6
Die Krankheitswiderstandsfähigkeit der Kartoffel. (**The disease resistance of the potato**).
Mitt. Landw. 1935 : **50** : 1013–14.
The author emphasizes the fact that resistance of a degree comparable with that of wart resistance is not known in respect of the other potato diseases. Scab resistance for instance varies in different years and in different climates. This is still more marked in the case of " Eisenfleckigkeit " (spraing), *Rhizoctonia* and other diseases, though it is possible that by breeding the degree of resistance may be raised. Breeding for general vigour will also doubtless help in this direction but it is clear that for some time the question of resistance to all diseases but wart must be a purely relative one.

1287. Schick, R. and Schaper, P. 633.491–2.411.4:576.16
Das Verhalten von verschiedenen Formen von *Solanum demissum* gegenüber 4 verschiedenen Linien der *Phytophthora infestans*. (**The behaviour of various forms of *S. demissum* to four different lines of *P. infestans*.**)
Züchter 1936 : **8** : 65–70, 102–04.
In addition to the S biotype of *P. infestans* (Cf. " Plant Breeding Abstracts," Vol. V, Abst. 620) and the common form, a third form was found in 1934 upon a specimen of *S. demissum* obtained from Leningrad and a fourth form has since been found. Tests were made with these four forms upon different pure inbred lines of *S. demissum*. The results shew that some of the *S. demissum* lines are resistant to all four biotypes, others are susceptible to all four and still others are resistant to certain biotypes and susceptible to others. Furthermore, many of the lines proved impure in this respect and shewed segregation in respect of resistance to one or other of the biotypes.
An examination of the segregating progenies shewed that in certain lines resistance was dominant, but in other cases, including cases of resistance to all four strains of the parasite, resistance proved to be recessive. Resistance is evidently determined by a number of genes, and by selection various lines were isolated which possessed new combinations of resistance and susceptibility to the different *Phytophthora* strains. This shews that in breeding for resistance only very few of the lines of *S. demissum* are suitable for use as parents. The most suitable varieties in the authors' collection are enumerated. The same is true of a number of the other South American species, e.g. *S. antipovichii*, *S. ajuscoense* and *S. verrucosum* ; none of the forms of these species so far tested has proved resistant to all *Phytophthora* lines. The only forms possessed of this full resistance so far known are *S. demissum* f. *utile* and its related forms.
Investigations on the inheritance of resistance in crosses within *S. demissum* are to be made.

1288. 633.491–2.411.4–1.521.6:575
SCHICK, R. and LEHMANN, H. 632.411.4:576.16
Zur physiologischen Spezialisierung von *Phytophthora infestans* de Bary. (**On the physiological specialization of P. *infestans* de Bary**).
Züchter 1936 : **8** : 34–46.

The culture of the fungus and the infection methods are described in detail.
In 1935, 246 clones belonging to the $F_1$, $F_2$, and back-crosses $F_2'$, $F_3'$ and $F_4'$ of crosses of *Solanum demissum* with *S. tubersosum* were inoculated with the four lines of *Phytophthora*. It was found that the clones could be divided into five groups according to their reaction to the four *Phytophthora* lines here investigated but this is not intended to be taken as an expression of their genetical constitution. Neither can conclusions be drawn from these results as to the significance of individual lines of the fungus for breeding work, for the importance of a new race lies not only in the fact that a clone, hitherto resistant, is attacked but also whether the clone is widely distributed or not.
Of the five groups of clones, *A* is resistant and *Z* susceptible to all the four lines, *W*, (so named because it includes the *W* races of Müller) is resistant to all except line 2 (the *S* strain of Müller), *K*, (which includes Knappe's *S. demissum* x *S. tuberosum* hybrid) is resistant to lines 1 and 2, *M* is attacked only by line 4 which only differs very slightly from line 3. Among the clones included in group *M* was an $F_1$ hybrid of *S. demissum* x *S. tuberosum*. Up to 1934 such hybrids were considered as immune to line 4 ; further experiments however shewed that $F_1$ hybrids of *S. tuberosum* with certain races of *S. demissum* were attacked by line 4.
From the crossing of *S. demissum* with the cultivated potato a resistant $F_1$ is obtained. If this is back-crossed to *S. tuberosum* the $F_2'$ contains only a small proportion of resistant plants. Further back-crosses of the best resistant plants produce in the later generations forms with the qualities of the cultivated potato combined with resistance to *Phytophthora*. It is, however, in practice impossible to inoculate with all known races of *Phytophthora* as a curious process of selection among the lines of the fungus occurs. It is therefore necessary for the breeder to produce strains of potato resistant to the most important races of *Phytophthora* and for this a test in the $F_2$ and $F_2'$ gives the best results.
The importance of a test collection and the possibility of the occurrence of new races of the fungus are discussed. Such new races are most likely to occur through hybridization.

1289. GIGANTE, R. 633.491–2.8:575
Nota preliminare sulla " Necrosi del cuore " dei tuberi di patata. (**Preliminary note on " heart necrosis " of potato tubers**).
Boll. Staz. Patol. Veg. Roma 1933 : **13** : (N.S.) : 155–59.

The degeneration of the potato tubers here described is regarded as identical with the " Herznekrose " described by Rothmaler in Germany and differs from the disease known as " hollow heart."
Investigations have discovered neither fungus nor bacteria as the causal agent but the progeny of degenerated tubers also shew the symptoms of heart necrosis.

1290. GIGANTE, R. 633.491–2.8:575
Secondo contributo alla conoscenza della necrosi del cuore dei tuberi di patata. (**Second contribution towards a knowledge of heart necrosis in potato tubers**).
Boll. Staz. Patol. Veg. Roma 1935 : **15** : (N.S.) : 555–60.

The degeneration of the potato tuber known as heart necrosis and already described by the author (Cf. Abst. 1289 above) was further investigated by planting plots with diseased tubers and with tubers which came from diseased plants but which did not shew the disease.
Degenerated tubers were found in both plots and shew that tubers from diseased plants though apparently sound should not be used for seed.
The grafting of healthy tubers with portions of diseased tubers failed to transmit the disease and at present any evidence that a virus is responsible is entirely negative.

1291. Vincent, C. L. and Jones, L. K. 633.491–2.8–1.521.6:575
**Resistance of potato varieties to infection by the veinbanding virus.**
Phytopathology 1936 : **26** : p. 112. (Abst.)
All the seedling strains developed from crosses involving the following parents have proved highly susceptible to infection by the veinbanding virus in the field : Early Six Weeks, McCormick, Late Rose, Bovee, Early Northern, Keeper, Jersey Red Skin, Irish Cobbler, American Wonder and Burbank, while of 420 strains in which Katahdin was involved as a parent, 22 have shewn a high degree of resistance.
Katahdin itself has shewn 33 per cent infection and Chippewa 13 per cent as compared to 100 per cent in susceptible varieties.

1292. Bushnell, J. 633.491.00.14
**New varieties of potatoes.**
Proc. 21st Annu. Mtg. Ohio Veg. Gr. Ass. 1936 : 107–11.
The results of a number of variety trials in Ohio are reported. Chippewa is the most valuable of the new varieties produced by the United States Department of Agriculture, especially on muck soils. Another new variety, Warba, from the Minnesota Experiment Station matures early and gives a high yield under favourable conditions, but has deep eyes and is very sensitive to conditions of growth, (Cf. also " Plant Breeding Abstracts " Vol. IV, Absts. 1014 and 1021).

1293. Chroboczek, E. 633.491"793":001.4(43.8)
Jak określać wczesność dojrzewania w doświadczeniach z pomidorami ?
(**How to express earliness in tomato experiments ?**)
Roczn. Nauk Ogrodniczych (Ann. Sci. Hort.) Warsaw 1935 : **2** : 135–42.
Owing to the different methods used in Poland for defining earliness in tomatoes the comparison of experimental results is difficult and in some cases the methods are actually incorrect.
The author proposes to designate as " early," ripe tomatoes gathered at the first three pickings ; while the number of pickings in the rest of the season should be divided into two equal parts, the first being termed " midseason," the second " late."

1294. Tyutin, M. G. 633.492:575
**(Selection of sweet potatoes).**
Soviet Subtropics 1935 : No. 12(16) : 57–67.
In view of the self-sterility characteristic of the sweet potato the floral biology assumes great importance for breeding and the available knowledge on the subject is reviewed in detail. The pollen is usually fertile and the failure to form fruit is due therefore to self-incompatibility, and cross-incompatible groups are also found to exist.
Breeding work was begun in the U.S.S.R. in 1930. All the lines examined proved to be very heterozygous. The descendants of one line shewed variations in starch content from 12·56 to 26·29 per cent. Some of the high starch lines also exceeded the maternal plant in starch content, and proved superior to the best American varieties in yield and drought resistance. Others have displayed distinctly improved keeping quality, a feature in which most sweet potatoes are deficient : some of the new lines will keep for a year and a half or even longer without curing. As regards flavour, some lines are quite free from sweetness and resemble the ordinary potato, others are only slightly sweet and reminiscent of chestnuts, whilst on the other hand some are so sweet and juicy as to be capable of use as fruits rather than vegetables. Another unusual feature characterizing some of the new strains is their capacity to grow on heavy soils ; also some very early maturing lines have been obtained.
Self-pollination is being applied to all the varieties in the attempt to produce self-fertile lines from which it will be possible to isolate desirable recessive forms by inbreeding.
In the period 1932 to 1934 over 16,000 crosses were made, involving twenty different combinations of parental varieties possessing different characters which it was desired to combine. Some of the hybrids exhibited marked heterosis, having large luxuriant stems and tubers weighing up to 4kg. and over. Such hybrids have been preserved by vegetative reproduction. In crossing, the percentage success varied from 0 to 30 and in one particular cross as much as 60 per cent

success was obtained. Some of the best hybrids are going to be further crossed with the most promising American varieties.
Interspecific crosses are being made with the object of further improving the keeping capacity, cold resistance, etc. and in 1932–1933 crosses were made of *Ipomaea Batatas* with *I. pandurata* and *I. macrorhyza*. Seedlings were obtained from all crosses, though some of them were feeble in growth.

1295. HIRAMA, S. 633.492:581.4(52)
**(The characteristics of the varieties of sweet potatoes in Formosa).**
Rep. Dep. Agric. Govt. Res. Inst. Formosa. 1935 : No. 68 : Pp. 123.
The opening chapters of this monograph deal with the botanical names of sweet potatoes, natural conditions and methods of cultivation in Formosa. Chapter IV deals with standards and methods of investigation of characters : the growth period, leaves, stems, tubers, yields of stems and tubers, time of flowering. In chapters V to VII the characteristics and classification of varieties are dealt with, the varieties investigated are tabulated and numerous correlations between different morphological characters are examined.
The question of synonyms and the nomenclature of varieties is treated in a supplement.

## FIBRES 633.5

1296. 633.5:575
**(Principles of the organization and methods of plant breeding. 3. Bast fibre plants).**
Suppl. 74. Bull. Appl. Bot. Leningrad 1935 : Pp. 112.
A collective work on the methods of breeding fibre plants, consisting of the following articles :—
N. D. MATVEEV. *The method of breeding flax for fibre. Problems of breeding flax for fibre.* (*pp. 7–28*).
The three ways are described in which genetic variability giving a suitable population for selection can be obtained : Firstly the collection of the greatest possible supply of breeding material from all possible sources ; secondly the production of segregation by hybridization ; and lastly artificial induction of mutations.
The methods of treating varieties for testing for special features such as yield, fibre quality, drought, cold and disease resistance, etc. are described and discussed. Detailed indications are given regarding all the observations that are made on the plants in the course of selection. Using the methods described, a new variety can be produced in seven years.
A. F. BEL'DENKOVA. *What can vernalization do for flax breeding.* (*pp. 29–32*).
The latest results are described.
S. P. ZYBINA. *Breeding flax for resistance to infectious diseases.* (*pp. 33–51*).
The greater the degree of specialization, both of the host and of the parasite, the greater are the possibilities of breeding resistant forms. Examples are given of the production of disease resistant flax by earlier workers in other countries. The Soviet work differs from earlier work in the use of the entire world collection for the choice of parental forms and in that both this and the hybrid populations are tested for resistance in a large number of different regions. In 1932, 346 specimens of different flaxes were tested for resistance to anthracnose, *Fusarium*, *Polyspora* and rust in a number of different areas. These tests shewed that flaxes of different geographical origins differed widely in their resistance to rust (*Melampsora lini*). The forms obtained from Argentina and the Mediterranean proved practically immune. Methods of artificial infecton are discussed and shewn to be one of the chief factors in successful breeding.
M. S. JAKOVLEV. *The anatomical method in flax breeding.* (*pp. 53–59*).
The attempts of various investigators to estimate the fibre content and quality by means of anatomical examination are described and criticized. The methods of carrying out the anatomical investigations are laid out and certain anatomical features which are found to affect fibre content are mentioned.

N. N. Griško and K. V. Maluša. *Problems, methods and technique in breeding hemp. I. Problems and directions of hemp breeding.* (*pp. 61–77*).

The directions in which Soviet hemp requires improvement by breeding are outlined. All forms of hemp are alike in chromosome number and cross easily and are therefore thought to belong to the same species. There are fifteen distinct botanical types, and geographical factors seem to have played the chief role in the differentiation of the species.

Variety tests in the U.S.S.R. have shewn that the southern forms are the highest in yield of fibre, and are often equal or superior to the Central Russian forms in fibre quality ; they are later in maturity however and so give a lower yield of seed. The southern forms are also less exacting as regards soil and temperature and tolerate frosts of up to –5°C. The Italian, certain French and several wild forms are immune to the local strains of *Orobanche* and the Japanese forms to the flax flea beetle.

The existing knowledge on the floral biology is outlined, in relation to the technique of fertilization. Wounding, short day and various other influences increase the proportion of bisexual forms and it is hoped by this means to select the lines with the greatest genetical tendency to bisexuality and perhaps produce bisexual varieties.

An outline is given of the various methods of breeding and the points for which selections are made. These are the length and diameter of stem, density of the inflorescence, unbranched nature of the stem, resistance to diseases and date of maturity. In the later generations attention is given to yield, content and quality of fibre and of bast, yield of straw and of seed, percentage and quality of oil, resistance to *Orobanche*, amount of dying off, percentage of male flowers and uniformity. Various methods of breeding are described, namely mass selection ; individual family selection with inbreeding, the best female plants being grown at wide spacing and pollinated with the best male plants of the same family ; family group selection with a common pollinator, the best family being chosen for this purpose at the very beginning, other male inflorescences being removed so that bagging is not necessary ; and lastly, hybridization.

In connexion with the search for indirect methods of selection the following correlations have been established : length of stem with weight of straw and with yield of fibre per plant positively and with fibre percentage negatively ; diameter at centre of stem positively with weight of straw, yield of fibre and length of stem, and negatively with fibre percentage ; weight of straw per plant positively with yield of fibre and diameter and length of stem and negatively with fibre percentage ; and hackling percentage positively with fibre percentage and negatively with fibre weight. The weight of fibre per plant is a character shewing a high degree of fluctuation, the fibre percentage is relatively constant, and these two characters shewed little or no correlation between themselves. The greatest fibre percentage however is normally associated with the lightest weighing forms with high yield after hackling, and the highest weight of fibres with the heavy, thick types with long stems. In order to combine these two qualities it will be necessary to select the exceptional individuals which do not exhibit this correlation, preferably types combining a light thin stem with high weight of fibre.

The methods of estimating these various factors are described.

I. A. Sizov. *Characteristics of the initial material of hemp from the point of view of its value for breeding.* (*pp. 79–92*).

The different types of hemp merge gradually one into the other through innumerable intermediate forms and no really sharp classification of them is possible. All have 10 haploid chromosomes and evidently belong to one species. The forms, especially those from different geographical positions, vary in height, a very important character for fibre purposes ; in the density of the inflorescence, the northern forms being the densest ; in weight of 1,000 seeds, which varies from 3 to 32 grm., the lightest seeds being found among the wild forms ; in form and colour of seeds, with a tendency for the darker forms to occur in the south ; in fibre percentage, the only clear geographical difference being that certain Indian forms have a very low fibre content. The fibre quality is distinctly better in the southern forms, the oil content higher in the northern forms. In anatomical structure of the stem both the Japanese and the Indian hemps are entirely different from the Russian ones ; the Japanese have very ribbed, symmetrical stems, the Indian ones stems elliptical in section ; the fibre bundles also differ in form, size and number in the different types, which differences influence the quality of the fibre.

In time of maturity the northern forms are very early, the southern forms very late, the extremes in vegetative period being respectively 60–70 days and 150–165 days. Similar differences are found in heat requirement. The southern forms, however, when grown in the north accelerate their maturity without reducing their height, evidently owing to vernalization and the effect of the long days, which makes them valuable for crossing with the northern forms for the improvement of the latter. Hybrids have already been obtained which combine the earliness of the northern with the height of the southern forms.
The northern forms are affected much more unfavourably by reduction in day length than the southern ones, but the latter give a favourable reaction to increased day length, in which respect again they are useful in breeding improved forms for the north. Again, the interval between the flowering and maturity of the male and female plants is much less in the southern forms and indeed in some Italian hemps the females flower first. Simultaneous flowering is very important in breeding, especially for conditions of mechanical harvesting.
The southern races are less drastically affected by drought than the northern. A prolonged period of low temperature affects them less than the northern forms, which are thereby induced to accelerate their flowering, sometimes by as much as a fortnight.
In the light of the above it is seen that there exists in hemp a wealth of initial material for breeding for almost any object without any necessity of having recourse to interspecific hybridization, X-rays or such methods. Experiments on inbreeding have shewn that in the second and third inbred populations it is possible to obtain plants exceeding the parents in height by 35–40 per cent and in size of seed by as much as 65 per cent and over. By brother-sister matings it is possible to fix these characteristics in pure breeding lines.

V. K. Serdjukov. *The technical analysis of fibre plants.* (*pp. 93–108*).
The methods of determining the fibre quality for different types of industrial utilization are described in detail.

*A conference at the Institute of Plant Industry on the question of initial material, the methods of breeding and variety testing of new bast fibre plants in* 1933. (*pp. 109–111*).
The areas of most importance as containing the main sources of initial breeding material are enumerated for (*a*) *Hibiscus cannabinus* (*b*) *Abutilon Avicennae* (*c*) *Apocynum venetum* (*d*) Ramie. The main problems in breeding, and the lines for solving them, are mentioned with respect to these same plants.

1297. Straumal, B. P. 633.51:575(47)
**(Cotton seed production).**
Bull. All-Union Sci. Res. Cott. Inst. (NIHI) Tashkent 1935 : No. 2(16) : 3–8, 139.
The famous variety Navrotskii, bred by E. L. Navrotskii in 1914 from the variety Russells, was produced by selecting for high ginning percentage and is in consequence somewhat deficient in lint length, which defect has been accentuated by later generations of seed multiplication. The new variety 8582, resembling Navrotskii in most respects, exceeds it by 10–15 per cent in yield of lint and 1–1·5 mm. in lint length. S. S. Kanash, who produced this variety, states that it was obtained from Acala by selection, but it seems more probable that the original plant was a hybrid between Navrotskii and Acala or some similar variety. In 1934 it yielded 9·26 c. per ha. as opposed to 9·71 from Navrotskii and its further cultivation is strongly recommended.
Other promising varieties are Triumph Navrotskii, 8427, 8517 and $M_2$. The two last-named have effected a notable increase in the lint length of the cottons produced, as compared with Navrotskii and Triumph Navrotskii.
The success of the scheme of seed distribution of the new varieties is analysed.

1298. Osborn, W. M. 633.51:575(76.6)
**Cotton experiments at the Lawton (Oklahoma) Field Station 1916–1931.**
Bull. Okla. Agric. Exp. Sta. 1933 : No. 209 : Pp. 31.
The results of variety trials over the period mentioned indicate the general conclusion that the medium early maturing types with long staple are the most desirable when the yields, length of staple, storm-proof character, quality of fibre, lint percentage and size of boll are considered. Certain selections made at the station and included in the trials have shewn an improvement over their parent varieties.

1299. 633.51:575"793"(47)
**New hybrid varieties of cotton.**
Science 1936 : **83** : p. 10. col. 2.
A note is given on new hybrid varieties of cotton bred for Russian conditions and from 8–10 days earlier than the old standard varieties. The appropriate articles have been reviewed in recent numbers of " Plant Breeding Abstracts."

1300. Webber, J. M. 633.51:575.127:576.354.4:576.1
**Interspecific hybridization in *Gossypium* and the meiotic behaviour of $F_1$ plants.**
J. Agric. Res. 1935 : **51** : 1047–70.
In $F_1$s of crosses within the cultivated American cottons (*Gossypium hirsutum*, *G. punctatum*, *G. barbadense*, *G. contextum* and *G. Schottii*) meiosis was similar to that in the parent species, 26 bivalents being the usual arrangement at metaphase I, occasional quadrivalents being observed; there appeared however to be a smaller number of chiasmata per cell.
The meiosis of $F_1$ hybrids within the cultivated Asiatic cottons (*G. arboreum* vars. *sanguineum* and *neglectum*, *G. africanum* and *G. herbaceum*) usually shewed 13 bivalents though occasionally 2 univalents were observed ; there was a considerable reduction in chiasma frequency. The $F_1$ hybrid between two wild American species *G. harknessii* (n = 13) and *G. armourianum* (n = 13) shewed regularly 13 bivalents.
The usual arrangement at metaphase I in *G. hirsutum* (n = 26) x *armourianum* (n = 13) and *G. contextum* (n = 26) x *armourianum* was $13_{II} + 13_I$ though $1_{IV} + 11_{II} + 13_{IV}\ 2_I + 9_{II} + 13_I$, and $12_{II} + 15_I$ were also observed. The bivalents form a well organised plate which generally includes a few elongated univalents, the remainder of the univalents being more or less spherical and scattered over the achromatic figure. The univalents on the plate occasionally are fragmented at anaphase. At the second division there are usually two major and several diminutive achromatic figures while the pollen tetrads contain 2 to 12 grains of various sizes. In the similar cross *G. barbadense* x *G. harknessii* more than 13 univalents were never observed and more of the bivalent chromosomes were united at both ends than in the other two crosses of this type.
Meiosis in the hybrid between *G. barbadense* and the wild Australian species *G. Sturtii* (n = 13) was very irregular and 39 univalents was the commonest arrangement, 1, 2, 3 and 4 bivalents being observed in different cells. Second metaphase plates with 39 chromosomes were observed and from 2 to 14 spores were formed in the tetrads.
Rather more bivalents than in the last cross were formed in hybrids between wild American species (n = 13) and *G. Sturtii*, from 0 to 6 being observed. Fragmentation of univalents was again observed in these crosses and in the preceding cross.
The hybrid *Thurberia thespesioides* x *G. Sturtii* was characterized by complete absence of chromosome pairing and the pollen tetrads are highly abnormal.
As in the crosses Asiatic x *G. Sturtii* and Asiatic x wild American, no viable seeds were obtained from attempts to cross Asiatic with cultivated American cottons, but a natural hybrid of this type was studied. The commonest conjugation was $13_{II} + 13_I$ ; pairing as low as $9_{II} + 21_I$ was observed and as many as 4 quadrivalents were sometimes formed.
In general the degree of compatibility between different species is not closely correlated with their morphological or taxonomic relationship. Crosses made in the morning and late summer were respectively more successful than those made in the afternoon and early summer.
The chief characters of the different hybrids are described. For the most part blending inheritance

was encountered but some characters shewed a tendency to dominance. Hybrids between species having the same chromosome number were usually intermediate, while those between species with different numbers resemble the parent with the larger number.
In discussing the bearing of the cytological results on phylogeny it is suggested that the occurrence of quadrivalents in certain hybrids between species with n = 26 and species with n = 13 confirms the suggestion that the basic number 13 has arisen by modified tetraploidy. The limited pairing in hybrids of wild American species with *G. Sturtii* may also support this hypothesis. The characteristic arrangement of $13_{II} + 13_{I}$ in hybrids between cultivated and wild American species and between Asiatic and cultivated American, considered in conjunction with the almost complete absence of pairing in the hybrid *G. barbadense* x *G. Sturtii*, confirms the hypothesis that the cultivated American cottons are allopolyploid, though the author considers that before the hypothesis that they arose by chromosome doubling in a cross between Asiatic and wild American cottons (Cf. " Plant Breeding Abstracts," Vol. IV, Abst. 864) can be accepted, the non-homology of the chromosomes of the Asiatic and wild American cottons must be demonstrated.

1301. Camp, W. H. 633.522:581.6:576.16(09)
**The antiquity of hemp as an economic plant.**
J. N.Y. Bot. Gdn. 1936 : **37** : 110–14.
A historical note in which the cultivation of hemp in prehistoric times and among Aryan and Mongol-Tartar peoples is mentioned. It is supposed that wild hemp was originally distributed over a large portion of temperate Asia, large parts of which are now too arid for this plant.
Hemp is apparently a true monotypic genus, as the forms are so similar in spite of its cultivation and differential selection by diverse and widespread racial groups since antiquity.

1302. Medvedev, P. F. 633.525.1:575
**(Initial stock and methods of ramie selection).**
Soviet Subtropics 1935 : No. 10 (14) : 62–69.
Collections, consisting of 82 specimens in all, have been made from all the main ramie growing countries, especially Formosa ; the collections include a number of other species besides the common *Boehmeria nivea* and some of these, though inferior from the fibre point of view, proved interesting in respect of frost resistance for growing in northerly regions. The most important of the forms in the collection, including some of the wild Japanese forms, are described, with indications of the characters in each which are of most interest for breeding.
The principal lines laid down for breeding are to increase the fibre content of the stems (15–20 per cent of the air-dry stem) ; the quality of the fibre (uniformity, fineness) ; the yield of stems, which is itself influenced by height and uniformity of stems and vigour of growth ; to reduce the branching ; and to increase the resistance to damage by wind and diseases and the suitability for mechanical harvesting. Besides this there are various special problems for special districts.
The main features of the floral biology of ramie are briefly described. For the creation of improved varieties various methods are in use, firstly individual clonal selection : the uncommon heterozygosity of the plants gives unusual possibilities to this method, and an outline of the procedure during the first five years is given, during which time it is possible to establish a new variety.
Another method is inbreeding, again favoured by the heterozygosity of the plants. Fourteen different geographical races were subjected to inbreeding in 1931 and twenty-six in 1932, all the chief varieties of *B. nivea* being thus included. All proved self-fertile in varying degrees, the least self-fertility being displayed by a line from Formosa and the greatest by one line from Japan and another from Formosa. The wild ramie, which differs considerably in habit from the cultivated forms, gave in the first inbred generation a number of forms scarcely to be distinguished from the cultivated ramie, some of them being of great promise for further breeding. All female forms in the first inbred generation developed also a certain number of male inflorescences and none were perfectly dioecious. Some of the lines produced a second inbred generation in 1932 and the plants are being tested for frost resistance. The results of inbreeding shew this to be a very promising method of improvement in the case of ramie. Further improvements, especially in quality, should be obtained by hybridization, by which means it may also be possible to make use of heterosis. Finally, distant crossing is recommended and special reference is made to the possibilities of crossing with *Urtica dioica* in the creation of annual forms suitable for the north.

1303. 633.61:575(85)

La crisis azucarera y las nuevas variedades de caña. (**The sugar crisis and the new varieties of cane**).

Circ. Minist. Fom., Lima 1934 : No. 24 : Pp. 13.

After a review of the many factors contributing to the sugar crisis, the results of sugar cane breeding in different countries are briefly outlined. In Peru cane seedlings are produced on two estates and at the Experiment Station, La Molina. Great hope is therefore entertained of an improvement in the canes available for cultivation and a plea is made for a more careful censorship of the canes permitted to be introduced.

1304. 633.61:575(92.2)

Observaciones sobre la variedad de caña P.O.J. 2714. (**Observations on the cane variety P.O.J. 2714**).

Bol. Minist. Fom., Lima 1934 : No. 4 : Pp. 35.

An account is given of the production of the main series of Java canes and of the results of cultivation of the variety P.O.J. 2714 in various countries including a very full description of the cane and its properties when grown in Peru.

1305. 633.61–2–1.521.6:575.42(76.3)

Abbott, E. V., Summers, E. M. and Rands, R. D.

**Disease resistance tests and seedling selections in 1935 at the U.S. Sugar Plant Field Station Houma, La.**

Sug. Bull. New Orleans, La, 1936 : **14** : 3–7.

Owing to the difference between Florida and Louisiana conditions a higher proportion of the new seedlings, beginning with the 1934 series is to be forwarded without preliminary selection from Canal Point, Fla, to Houma, La where the first season's mosaic, red-rot and sucrose tests will be made and selected canes given C.P. numbers.

A list of the more promising crosses tested in Louisiana during the past three years is given.

In 1935 a large scale effort was made to raise to maturity and test in Louisiana seedlings which had been germinated at Canal Point, Fla. Although the need for better facilities was indicated, the experiment shewed that a great saving of time could be made in this way. One new cross C.P. 28/11 x C.P. 27/38 was found to be particularly outstanding in respect of the large number of selections combining resistance to red rot with early maturity.

Seedlings are divided into classes, 1 (resistant) to 4 (very susceptible) on the basis of their resistance to diseases, in particular mosaic and red rot and it is hoped ultimately to confine variety and other agronomic tests to canes of classes 1 and 2 ; at present however, recourse has also to be had to class 3. The reaction to diseases of several of the more recent C.P. canes is briefly described.

1306. Savizky, V. F. 633.63:575

(**Cultivating beet by hybrid method**).

Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1933 : **10** : No. XXXVI : 51–78.

Owing to the very early start made by sugar beet breeding many of the early methods such as mass selection have become too deeply ingrained, to the exclusion of the more modern methods. For further improvement in sugar beet it is essential that these modern methods be applied as in other plants, e.g. the use of the whole range of initial material, including wild beets, for hybridization, inbreeding, the study of the inheritance of the most important characters such as sugar content and the production of mutations, etc.

For testing the value of plants for parents the method of vegetative reproduction is used. A promising plant is taken and from it 15 to 35 buds are rooted. In the following year half the plants produced are used for diallel crossing with 2–3 other promising clones, the other half being further multiplied vegetatively, thus yielding 150–450 new clonal plants.

Elaborate directions are given for carrying out sugar beet breeding on the new lines, both by the method of hybridization and by the method of inbreeding followed by hybridization, if necessary with high yielding self-sterile lines, for though pure breeding self-fertile lines have been obtained most of them are up to the present low in yield. Various means of accelerating breeding by growing the seeds in the greenhouse, with or without vernalization, etc., are suggested. Where it is necessary to introduce one or a small number of isolated characters from one type of beet to another the method of repeated back-crossing is recommended.

1307. 633.63:575:581.02

RASMUSSON, J. 633.63.00.14

Les effets de la sélection sous différentes conditions de climat et de culture. (**The effects of selection under different conditions of climate and cultivation**).

Résumés des Communications et Rapports présentés au IV$_{me}$ Congrès International Technique et Chimique des Industries Agricoles, ayant trait à la betterave sucrière.

Publ. Inst. Belge Amélior. Better. 1935 : **3** : 400–01.

The importance in beet breeding and in variety trials of ensuring a favourable environment for the expression of the desired genetically conditioned characters is pointed out, with special reference to climate and nutrition.

1308. SEITZ, F. -W. 633.63:575.127.2:576.356.5

Contribution à l'étude de la karyologie de l'hybride de *Beta trigyna* avec la betterave sucrière. (**Contribution to the study of the karyology of the hybrid of *B. trigyna* with sugar beet**).

Résumés des Communications et Rapports présentés au IV$^{me}$ Congrès International Technique et Chimique des Industries Agricoles, ayant trait à la betterave sucrière.

Publ. Inst. Belge Amélior. Better. 1935 : **3** : 399–400.

Setting out from the fact that the genus *Beta* contains a group of plants forming a polyploid series (n = 9), composed of *B. vulgaris* and *B. procumbens* (2n = 18), *B. lomatogona* (2n = 36) and *B. trigyna* (2n = 54), attempts have been made to obtain a polyploid sugar beet by crosses with wild forms. A reciprocal cross of *B. vulgaris* with *B. trigyna* gave an $F_1$ hybrid in which the female organs only were fertile. On crossing this generation with sugar beets an $F_2$ was obtained. The following chromosome numbers are given : for $F_1$ 2n = 36 and $F_2$ 2n = 27.

The various causes of male sterility are to be investigated this year.

1309. 633.63:575.14

ARCHIMOVITCH, A. 633.63:581.162.3

(**Application of the inbreeding method to sugar-beets**).

Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1934 : Nos. 11, 12 : **10** : Nos. XXXVII, XXXVIII : 143–56.

The data of other authors on the percentage of cross and self-pollination in sugar beet are reviewed, the different methods of determining this being described.

Observations of the author over three years, starting from 1930, shewed the average degree of self-fertility in bagged plants to be very low, varying from 1·9 to 4·2 per cent. Great differences were observed, however, in different clones and certain clones were distinguished by quite high fertility, which was maintained for a number of consecutive years. The merits of various kinds of isolators for selfing are analysed ; a method recommended for preventing chance pollination from external sources is to wet the stems with a tobacco spray before applying the isolator, which both kills the aphides and any pollen that may be upon the stem.

The various methods of artificial hybridization are also described.

1310. Claus, E. 633.63:581.192:575
Recherches sur le conditionnement génotypique et phénotypique des variations de valeur des cendres de la pulpe de betterave sucrière, déterminées par voie conductimétrique. (**Investigations on the genotypic and phenotypic causation of the variations in the value of the ash of sugar beet pulp determined by conductivity method**).
Résumès des Communications et Rapports présentés au IV^me^ Congrès International Technique et Chimique des Industries Agricoles, ayant trait à la betterave sucrière.
Publ. Inst. Belge Amélior. Better. 1935 : **3** : 398–99.
The extent of the variation was studied in a series of experiments in which races and lines of beet roots were used in order to detect any genotypic effects.

1311. Karpenko, P. V. 633.63–1.531.12:575
(**Selection of seed in sugar beet and the question of its mechanical harvesting**).
Zapiski Voronežskogo Sel'skokhozjaistvennogo Instituta (Trans. Voronesh Agric. Inst.) 1935 : **1** (16) : 154–74.
Very little attention has been given to the characters of beet plants in their second year of growth and an examination of a number of varieties shewed that considerable differences exist in the number and disposition of the branches, duration of flowering, time and uniformity of maturity of seed, etc., all of which have a marked influence upon the yield and quality of the seed and the convenience of collecting it, which is expecially important when mechanical harvesting is employed. Great differences in the yield of seed per plant were observed in different varieties and the best varieties were different for different regions. The fact is of great importance in seed production, especially in new regions of beet cultivation, and should be given attention by breeders.

1312. Schneider, F. 633.63–2.111–1.521.6:581.143.26:575
Die Züchtung von Winter-Zuckerrüben. (**The breeding of winter sugar beets**).
Zuckerrübenbau 1935 : **17** : 125–30.
Previous work on the late sowing of sugar beet and on the production of a winter type of beet is discussed and an experiment by the Kleinwanzleben sugar beet factory to develop a late maturing type of beet in which seed formation would not occur till the third year is outlined.
For the initial material it was necessary to select types from families highly resistant to bolting, which is regarded as due to the interruption of the vegetation period by cold weather in the Spring when early sowing is practised ; such resistance would be even more necessary with autumn sowing. From the rarity of families resistant to bolting after overwintering the author is inclined to regard the character as being polyfactorially instead of monofactorially conditioned.
Beets from the selected families, when sown about the 1st September, proved completely winter-hardy in all years.
The correlation generally held to exist between dark leaf colour and late maturity appeared to hold good for the experimental families too.

1313. Orlovsky, N. I. and Oumanska, L. V. 633.63–2.112–1.521.6
(**Methods of studying drought-resistance in sorts of the sugar-beet in connection with the selection perspectives based upon the above property**).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1934 : Nos. 11, 12 : **10** : Nos. XXXVII, XXXVIII : 166-75.
Observations on the relative degree of drought resistance were made on a number of varieties of sugar and forage beet in a series of pot and field experiments designed for this purpose. Both in the field and on growing seedlings in pots without watering from the time of development of

the first pair of true leaves until 50 per cent of them had died from drought, clear varietal differences were disclosed and this latter method is suggested as of possible application in selecting drought-resistant lines.
Determinations of the dry matter content by means of the field refractometer shewed that the highest degrees of drought resistance were correlated with the least dry matter content under conditions of low soil moisture. Direct determinations of the water content of the leaves under drought conditions gave the same result.
According to all these tests the variety Kharkov proved the most resistant and the combination of all the methods is therefore recommended as a means of choosing suitable parents for breeding drought-resistant beets, for which purpose the whole world collection should first of all be put to the test.

## STIMULANTS 633.7

1314. Benincasa, M. 633.71 Kentucky Gentile
Il " Kentucky Gentile " un interessante sottotipo di tabacco pesante.
(**" Kentucky Gentile " an interesting sub-type of heavy tobacco**).
Boll. Tec. Tab. 1936 : **33** : 3–4.
The variety described is derived from pure Kentucky crossed with other Italian and foreign tobaccos and is distinguished by a low nicotine content and a better burning quality. It is earlier than Kentucky but is susceptible to *Thielavia*.

1315. Benincasa, M. 633.71 Kentucky Italia
Il " Kentucky Italia." (**Kentucky Italia**).
Boll. Tec. Tab. 1936 : **33** : 29–30.
Derived from a cross between Italia with Kentucky, this variety is resistant to *Thielavia*, earlier and less productive than Kentucky.

1316. Bučinskij, A. F. 633.71:575"793"
**Inheritance of duration of vegetation period in tobacco.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1935 : **4** (IX) : 231–36.
In crosses of tobaccos differing in earliness the $F_1$ hybrid was usually equal to the early parent in earliness or exceeding it ; more rarely the $F_1$ was intermediate. The $F_2$ generation was exceedingly varied, with marked transgression for earliness and for lateness in all crosses where sufficiently large families were examined. This transgression was still more frequent in the third generation.

1317. Johnson, J. 633.71:575.12:632.8–1.521.6:578.081
**A tobacco hybrid useful for virus studies.**
Amer. J. Bot. 1936 : **23** : 40–46.
On crossing *N. Tabacum*, in which the ordinary mosaic virus produces a systemic infection, mottling and malformation without primary necrotic lesions, with *N. glutinosa*, which gives a local and necrotic reaction to the virus without the other symptoms, a hybrid was obtained resembling *N. Tabacum* morphologically and completely sterile.
Though the type of mosaic reaction obtained with the hybrid resembles that of *N. glutinosa* in the absence of mottling or malformation, it may become partially systemic, resulting in the discoloration and death of the invaded tissues, thus enabling the path of the virus in the plant to be traced.
Though resembling *N. Tabacum* in being fairly susceptible to systemic invasion by mosaic the hybrid is no more susceptible to infection than *N. glutinosa*. In susceptibility to other viruses the hybrid behaves very much like the two parent species, but it is considerably more " resistant " to symptom expression of the tobacco ring-spot virus than is *N. Tabacum*.
Aphid transmission and the role of temperature in the multiplication of the virus and predisposition to infection were also studied in the hybrid.

1318. Nolla, J. A. B. 633.71:575.127.2:575.115
**Inheritance in *Nicotiana*. II. "The conception of reaction system contrasts in heredity."**
J. Hered. 1936 : **27** : 121–26.

In *Nicotiana Tabacum* x *N. sylvestris* crosses in which the *Tabacum* varieties Ceniza and Consolation (Cf. "Plant Breeding Abstracts," Vol. VI, Abst. 603) were used, the $F_1$ hybrid differed from the *Tabacum* parent in respect of plant colour. Again, the strain of Ceniza used had stamen filaments which were hairy over their whole length instead of only the basal one-third as in most *Nicotiana* species ; in the $F_1$ only the basal one-third was hairy.
The hybrids studied therefore provide exceptions to the general rule that *N. Tabacum* x *N. sylvestris* hybrids are, outwardly, enlarged replicas of the *Tabacum* parent, a phenomenon which Clausen and Goodspeed attributed to dominance of the *Tabacum* "reaction system" over the *sylvestris* system. It is suggested therefore that the usual dominance of *Tabacum* characters in the interspecific hybrid is due to a greater potency of the individual *Tabacum* genes as compared with the corresponding *sylvestris* genes, often even when recessive genes in the former are compared with dominant genes in the latter. In the present cases, however, the recessive *Tabacum* genes for the characters mentioned are not stronger than the corresponding *sylvestris* genes and the latter can therefore shew their influence.

1319. Kostoff, D. 633.71 *N. rustica* : 576.356.52
**Studies on polyploid plants. XIII. Haploid *Nicotiana rustica*.**
C. R. (Doklady) Acad. Sci. U.R.S.S. 1936 : **1** (X) : 239–42.

In *N. rustica*, which has the same chromosome number as *N. Tabacum* and *N. triplex*, no haploid plant had been produced until 1935, when one appeared on hybridizing *N. rustica* with *N. Tabacum* variety Xanty Yaka. It was smaller than the diploid and almost all the flowers were reduced and sterile. It had 24 somatic chromosomes.
Very little pairing occurred at metaphase and about 10–15 per cent of dyads were observed in the pollen. The absence of pairing in the haploid suggests that *N. rustica* is an allopolyploid. *N. paniculata* is one of the probable parents.

1320. Schmuck, A. and Khmura, M. 633.71:581.192.6:575.127.2
**(The variability of the alkaloid complex in hybrids of certain *Nicotiana* species).**
Bull. Appl. Bot. Leningrad 1935 : Ser. A (15) : 111–21.

Analyses have shewn that certain species other than *Nicotiana Tabacum* contain alkaloids other than nicotine, which are not volatile in steam and are sometimes present in considerable quantities. Also the volatile portion of the alkaloid often proved to be quite different from nicotine, as shewn by the melting points of the picrate, whilst true nicotine is altogether absent. Nicotine is also absent in *N. sylvestris*, which contains only one volatile alkaloid whose picrate melts at 180°C. as compared with nicotine with a melting point of 218°C. $F_1$ hybrids between *N. Tabacum* and *N. sylvestris* contained this same volatile alkaloid, whose picrate also melted at 170–180°C. These hybrids contained a much larger proportion of non-volatile alkaloid than *N. Tabacum*, but no nicotine. The proportion of volatile alkaloid was, however, greater than in the *N. sylvestris* parent, in which character therefore the hybrid more closely resembled the *N. Tabacum* parent. The $F_2$ from these plants was extremely varied both in content of alkaloid and its type. The majority of them had a greater proportion of volatile than non-volatile alkaloid, and thus resembled *N. Tabacum* even more than the $F_1$. Certain plants did however approach *N. sylvestris* in their content of non-volatile alkaloid and in others the proportions of the two were more or less equal. Seven of the 16 plants with predominantly volatile alkaloid gave a picrate of the nicotine type, melting at 217°C., one melted at 186°C. and one at 210°C.; the latter picrate after recrystallization melted at 218°C. One single plant with the alkaloid characteristic of *N. sylvestris* but in proportions characteristic of *N. Tabacum* is especially interesting.
In the two plants with predominantly non-volatile alkaloid the volatile portion consisted entirely of nicotine, which also predominated in the plants of intermediate type ; some of these, of which there were seven in all, had however the alkaloid of the *N. sylvestris* type, while certain

ones contained a mixture of the two, in which the melting point of the picrate was indefinite and changed with recrystallization.
An $F_3$ was produced from the plant combining the *N. sylvestris* alkaloid with the proportions characteristic of *N. Tabacum*. In four of the six $F_3$ plants nicotine was the predominant alkaloid and the non-volatile section was entirely absent ; one plant retained the characteristics of the $F_2$ and one contained a mixture of the two alkaloids.
The plants of the mixed type in $F_2$ also gave further segregation in $F_3$ and even the plant most nearly approaching to *N. Tabacum*, whose volatile alkaloid was 98·5 per cent nicotine, segregated in $F_3$ and gave plants containing the *N. sylvestris* alkaloid.
Thus clear segregation occurred in the $F_2$ and $F_3$ but no alkaloid of a new type was produced in the volatile section ; there are indications that the same was true of the non-volatile section.
Crosses were also made between *N. Rusbyi* and *N. sylvestris*. The $F_1$ plants contained mainly the *N. sylvestris* type of alkaloid but at least two of them were also found to contain nicotine. There are indications that minute quantities of nicotine occur in *N. Rusbyi*, and if this is so even this is not a case of the production by hybridization of a substance not present in the parents.
Hybrids of *N. Rusbyi* x *N. Tabacum*, though strongly resembling *N. Tabacum* in external appearance, were found to be entirely free from nicotine.

1321. 633.71–1.524.4:575(43.7)
Súhrn výsledkov ankety ČAZ o pestovaní tabaku v ČSR. (**Results of the enquiry of the Czechoslovakian Academy of Agriculture on tobacco cultivation in the Czechoslovakian Republic**).
Časové Otáz. Zeměd. 1934 : No. 43 : 113–16, 139–43.
Among the measures suggested for improving the quality of tobacco grown in the Czechoslovakian Republic are the choice of soils best adapted to the tobacco plant and its varieties. The improvement of indigenous varieties, selection and breeding of foreign varieties should ultimately render it possible to apply the heterosis method of breeding to obtain the desired results. Nicotine content and disease resistance should be considered ; and purity of seed should be ensured by official control by research institutes and experiment stations.

1322. Clayton, E. E. 633.71–2–1.521.6
**Studies on methods for the measurement of disease resistance in *N. tabacum*.**
Phytopathology 1936 : **26** : p. 89. (Abst.)
Collections of tobacco varieties and strains are being studied for resistance to black root rot (*Thielaviopsis basicola*), Granville wilt (*Bacterium solanacearum*), Fusarium wilt (*Fusarium oxysporum* var. *nicotiana*), black shank (*Phytophthora parasitica* var. *nicotianae*), stem rot (*Sclerotium rolfsii*), mildew (*Peronospora tabacina*), wild fire (*Bacterium tabacum*), black fire (*Bacterium angulatum*) and mosaic. Consideration must be given in testing the type of resistance, whether physiological or morphological and to the effect of factors modifying its expression, such as age of plants, temperature and plant nutrition.

1323. McIlvaine, T. C. and Garber, R. J. 633.71–2.42–1.521.6:575
**Inheritance of resistance to root rot in tobacco caused by *Thielavia basicola*.**
J. Amer. Soc. Agron. 1936 : **28** : 279–83.
In the course of a breeding project for the production of a strain of Burley tobacco resistant to root rot the inheritance of resistance was studied in crosses between 10 Ba, a resistant plant of the stand-up Burley type and Kelly, susceptible and of high quality, reduction in height being taken as a criterion of infection.
In 1933 about one quarter of the progenies obtained by backcrossing the $F_1$ to Kelly and then selfing reacted similarly to the resistant parent when grown in infected soil ; in 1934 over one half reacted in this way. $F_1$ plants from the cross 10 Ba x Kelly were for the most part resistant. It is concluded therefore that resistance is heritable, as a dominant or partially dominant character, though it is not possible to say how many factors are concerned.

1324. 633.72:575(47)
633.72:575.42(47)

*Bakhtadze, K. E.

(**Methods of tea selection**)

Soviet Subtropics 1935 : No. 2(6) : 9–15.

*Camellia theifera sinensis* L. which has been proved best adapted to conditions in Georgia is the main botanical variety in cultivation in that region. In breeding for improvement this variety with its high resistance to frost, diseases and pests is being used as well as a certain proportion of Indian-Chinese hybrids, and various crosses are being made with the object of obtaining forms with the desirable characteristics of the Chinese type with the high quality of the Indian forms. High yield and drought resistance are also included in the breeding programme and good results are expected from proposed crosses of Chinese and pure Indian varieties. Valuable resistant types could, it is believed, also be obtained from crosses of *C. theifera* with *C. Sasangua* and *C. japonica* which grow along the coast near Batoum.

From crossing and inbreeding in Adžaristan about 2,500 hybrids and 2,000 inbred plants have been obtained, but mass and individual plant selection are also practised and these methods are described in detail. The plant material is obtained from the sovkhozes and kolkhozes of various regions and it is ultimately hoped that all tea districts will be included to provide material for selection work and pedigree seed.

In the meantime existing seed nurseries are being used as a source of supply for the laying down of new tea plantations. Japanese types and inferior Chinese varieties are to be eliminated from plantations and the necessary agronomic measures and careful management of the seed nurseries are expected to improve both quality and yield. It is suggested that a number of nurseries which have already attained a high standard should be kept apart as a special group for the supply of plants of pedigree seed.

In connexion with the work of improving existing temporary seed plantations, which are unsatisfactory either in the way they are laid down or in their composition, it is also hoped that new nurseries may ultimately be established to supply a hybrid type for the more southern regions and a Chinese type for the northern districts.

1325. 633.72:575:581.192
633.72:575.42(47)

*Timoshenko, M. T. 633.72–2.111–1.521.6

(**The selection of tea for its chemical composition**).

Soviet Subtropics 1936 : No. 1 (17) : 25–31.

Three main types of the tea plant, (1) the extreme southern type (Assam) grown in Russia, (2) the extreme northern type (also Assam) and (3) the Indian-Chinese hybrid (Badamtam), were selected and examined for their content of tannin, caffeine, resinous substances and the activity of their enzyme system.

The chemical technique used in the examination of the leaf is described in detail.

The bushes of the southern type and Badamtam resembled each other closely and shewed the highest tannin content. They should therefore be used as breeding material, though wide individual variation in plants within the same category (e.g. the southern group) as well as variation according to season must be allowed for in selection.

The results obtained for the caffeine content shewed similar relations between the three groups of tea and a parallel situation too as regards seasonal variation.

The enzyme activity of each type of tea differed for each enzyme. The greatest activity of invertase and glucosidase was observed in the southern type and the least in the northern type and the Indian-Chinese hybrid.

Estimation of the amount of resinous substances in the leaf shewed that during the summer it remains almost equal for the different varieties ; then in September an increase begins and this rise lasts throughout the winter, the maximum being reached towards the middle of March, after which a decline sets in.

It is suggested that the relation between the metabolic state of the plant in winter and the accumulation of resinous substances at that time offers a chemical means of diagnosing frost resistance in the tea plant which might be of great value in selection for breeding purposes.

* **Full translations of these papers are on file at the Bureau.**

1326. MAHER, A. C. 633.73:575(67.62)
Importance du choix des variétés de Cafés. (**The importance of the choice of varieties of coffee**).
Agric. Elev. Congo Belge. 1936 : **10** : 3–5.
French form of article already reviewed (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 733).

1327. 633.73:575.42
Selección de la semilla de café. (**Seed selection in coffee**).
Rev. Cent. Nac. Agric. Costa Rica 1936 : **1** : p. 29.
The importance of using only seeds from the best trees for planting is emphasized and brief directions are given for carrying this out.

1328. 633.73:581.162.3(92)
FERWERDA, F. P. 633.73:581.48
Die Befruchtungsverhältnisse bei den in Niederländisch-Indien angebauten Kaffeearten. (**The pollination behaviour of the coffee species cultivated in the Dutch East Indies**).
Züchter 1936 : **8** : 92–102.
The investigations were made on clones of *C. robusta, C. liberica, C. excelsa,* on certain species hybrids and on the so-called Conuga clones.
Robusta is mainly self-sterile but some self-fertile clones were found and here and there cases of inter-sterility occurred. The planting of mixed clones is therefore advised.
*C. liberica* is only partly self-fertile and *C. excelsa* gave only a 1 per cent set when self-pollinated. The *liberica-arabica* hybrids were self-fertile and inter-fertile both with themselves and with the *excelsa-robusta* hybrids. The *robusta-excelsa* hybrids on the other hand were self and inter-sterile but set well when pollinated by the *liberica-arabica* hybrids.
The Conuga clones shewed self and inter-sterility but not to so great an extent as *C. robusta.*
The pure species shewed only a few aborted seeds but in the hybrids they were very frequent. On the whole, there was a higher percentage of aborted seeds among the mainly self-sterile sorts and the sterile combinations which probably indicates some physiological connexion between self-sterility and the aborted seeds. The self-fertile *liberica-arabica* hybrids, however, shewed after self or cross-pollination, an almost constant percentage of aborted seeds which points to a zygote sterility cytologically caused.

## AROMATIC PLANTS, SPICES, ETC. 633.81/4

1329. MAKAROVA, K. N. 633.812:575.252
(**A new variety of selected geranium**).
Soviet Subtropics 1935 : No. **3** (7) : 71–72.
The chance observation of deviating forms among the plants obtained from cuttings led to the discovery of one unusually promising plant from which a remarkable new line has been obtained which is superior to the standard variety in vigour and rapidity of growth, yield, earliness and essential oil content, in the latter respect by 45 per cent. This led the author to plant 1,000 cuttings, from which 250 mature plants were obtained. Observations on these are in progress.

1330. TRELEASE, W. 633.841(8)
**The pedicellate peppers of South America.**
Proc. Amer. Phil. Soc. 1935 : **75** : 691–716.
A latinized key of the genus *Ottonia* is set out together with English descriptions of the various species. Finally a brief list of species excluded from *Ottonia* is given.
Difficulties in the taxonomy and nomenclature of the peppers are discussed.

1331. 633.85:633.367
633.367:575(47)

IVANOV, N. N. (Editor)

**(The finding of the oleiferous lupin).**

Bull. Appl. Bot. Leningrad 1935 : Ser. 3 (10) : 1–34.

After the discovery of the alkaloid-free lupins a study was made of the variation in oil content within the genus *Lupinus*, using the new refractometric method for the rapid determination of oil in a single seed elaborated by A. I. Ermakov, which is described. Twenty-two different species and their respective varieties were examined. Great variations were observed both between the species and within individual species ; some of the white lupins (*L. albus*) were found to contain up to 14·7 per cent of oil and in *L. mutabilis* plants with 21·3 per cent were found. Differences were also observed in the quality of the oil, iodine number, etc. The high oil containing forms also possessed high protein content but so far all contain alkaloid. The problem now therefore is to combine the high protein and oil content with the alkaloid freedom. The selection of high oil forms from the available sweet lupins is a doubtful method of achieving the desired combinations, as these are mainly either *L. luteus* or *L. angustifolius*, which the present results shew to be rather low in variability as regards oil content. There seems more likelihood of selecting alkaloid-free forms from *L. mutabilis*, the species with the highest oil content. Another way would be to combine the two qualities by hybridization, if this can be done without sacrificing the protein content. Comparison of the oil and protein content of a number of forms shewed that both are hereditary varietal characters and apparently independent, so that their combination should not be a matter of difficulty.

As *L. mutabilis* is a South American species it is adapted to the more southerly regions of the Soviet Union. To make it available to the whole Soviet territory it will be necessary to apply vernalization to select earlier maturing forms. The other lines on which lupin breeding is to be developed are outlined.

1332. TSCHERMAK-SEYSENEGG, E. 633.85:635.623:575

Züchterisches über eine nicht genügend gewürdigte heimische Ölfrucht. **(An insufficiently appreciated local oil seed from the breeding point of view).**

Anz. Akad. Wiss. Wien 1934 : **71** : 64–65.

The vegetable marrow with shell-less seeds is referred to ; by crossing it with an upright form a type has been produced which is both upright and shell-less. This form contains much more oil than the normal marrows and its use for oil, and perhaps as a substitute for almonds, is recommended.

1333. FLOR, H. H. 633.854.54–2.483–1.521.6

**Browning disease of flax in the United States.**

Phytopathology 1936 : **26** : 93–94. (Abst.)

Bison was found to be the linseed variety most susceptible to *Polyspora lini*, followed in order of decreasing susceptibility by Red Wing, Linota, Buda and Rio. The disease causes a decrease in yield and average weight per seed, but no significant difference in percentage oil content or oil quality (iodine number).

1334. SMOLSKY, N. V. 633.854.56:575

**(Suggestions for the selection problem of the tung-oil trees).**

Soviet Subtropics 1935 : No. **4** (8) : 16-39.

The author discusses the variation occurring in the species *Aleurites Fordii*, *A. cordata* and *A. montana*, with numerous tables and illustrations. The biological features of flowering are described, such as the nature of the flowers, the tendency to dioeciousness in *A. cordata*, and the morphology of the various floral organs, partly with a view to distinguishing between the male and female flowers before they open. The course of flowering and pollination in the different forms is described in detail. It has been observed that chafers, though useful to a certain extent in effecting pollination, cause considerable damage to the flowers and cause the fruits to

drop ; some trees proved much more susceptible to this than others. Ants are therefore the chief pollinating agents.
No case of parthenocarpy has been observed, but upon occasion fruits have developed on *A. cordata* under conditions where all possibility of pollination was excluded, indicating that either parthenogenesis or apogamy had occurred.
Artificial self-pollination carried out in three forms of *A. Fordii* and one of *A. cordata* produced large numbers of fertile fruits, far in excess of those formed by trees left to pollinate naturally. *A. cordata* was slightly less fertile than *A. Fordii*. Almost equal success was obtained in artificial cross-pollination between different trees in both species.
The chief defect of *A. Fordii* for the Soviet subtropics is its late maturity and for this reason it was crossed with *A. cordata*, which ripens quite two months earlier. A number of well developed seeds resulted from the crosses and one cross gave a success of 25 per cent, other combinations varying from 0 to 17 per cent. Other interspecific combinations are also of interest.
The main problems of tung breeding for the Soviet Union are outlined. The methods to be adopted are firstly the introduction of large stocks of initial material, especially of *A. Fordii*, and more particularly of those varieties found in the most northerly portions of its natural area (North China, the provinces Sei-chwan, Hopei and Shen-si). Secondly hybridization, both within the species and between species. This is of particular importance in breeding for adaptation to poor climatic and growth conditions and for combining high yield with high oil quality ; it is hoped by hybridization to combine frost resistance, early maturity, high yield, high quality, adaptation to particular soil conditions, etc. The crosses *A. cordata* x *A. Fordii*, *A. Fordii* x *A. montana* and *A. cordata* x *A. montana* are the most interesting and by crossing these hybrids back to *A. Fordii* it should be possible to obtain early maturing forms possessed of all the desirable qualities of *A. Fordii*.
It is possible that the method of inbreeding may have advantages in disclosing a number of valuable recessive characters and removing undesirable ones and even the method of clonal selection may not be without its uses in the production of improved forms.

1335. 633.854.56:576.312.32
633.854.56:575.127.2
BACHTADZE, K. E.
(**About the chromosomes of the tung-oil trees**).
Soviet Subtropics **1935** : No. 6 (10) : p. 75.

Root tip examinations by Levitsky's method shewed the presence of 22 very small somatic chromosomes both in *Aleurites cordata* and *A. Fordii*. All the chromosomes have a median attachment constriction and differ in the two species only in the relative lengths of the arms, which are more unequal in *A. cordata* than in *A. Fordii*.
In 1934 crosses were made between the two species, 72 fruits being obtained from 265 crosses with *A. cordata* as female parent and 211 from 735 crosses with *A. Fordii* as female. This represents a percentage success of 27.2 and 28.7 respectively, shewing that the two species hybridize with relative ease.

1336. DANIEL, L. 633.854.78–1.541:581.162:635.24
Variation des plantules d'"*Helianthus Dangeardi*" à la septième génération sexuée. (**Variation of young plants of "*H. Dangeardi*" at the seventh sexual generation**).
C.R. Acad. Sci. Paris **1934** : **198** : 1962–65.
DANIEL, L.
L'hérédité des monstruosités chez les descendants du topinambour greffé sur soleil annuel à la 8e génération sexuée. (**The inheritance of abnormalities in the progeny of the artichoke grafted on the sunflower at the eighth sexual generation**).
C.R. Acad. Sci. Paris **1935** : **201** : 801–03.

As a result of repeated grafting on the common sunflower the sexual fertility of *Helianthus Dangeardi* was restored as shewn by the large numbers of achenes obtained in 1933. Among the seedlings raised in 1934 however a large number shewed various abnormalities in cotyledons and leaf system. The nature of these anomalies and their relations in the young and adult plant are briefly considered in the second paper.

1337. 633.854.78–2.5–1.521.6:575
633.854.78:575"793"
633.854.78:575.12:665.3

Züchtung der Sonnenblume. (**Sunflower breeding**).
Tropenpflanzer 1936 : **39** : 84–85.

Breeding work in Russia with sunflowers has shewn that oil content is not only heritable but also dependent on the maturation of the seed and to some extent on the soil. Very early varieties requiring only 70 days to ripen have been bred. Also forms with seeds which have a hard covering and are resistant to *Homoeosoma nebulella*, have been obtained by crossing the resistant Californian sunflower with the Caucasian type which though susceptible to the pest has a high oil content.

Forms of sunflower entirely immune to attack by *Orobanche cumana* have also been obtained by breeding. (Cf. " Plant Breeding Abstracts," Vol. V, Absts. 770 and 771, and Vol. VI, Abst. 232).

1338. BEIRNAERT, A. 633.855.34:581.162:577.81

Introduction à la biologie florale du palmier à huile (*Elaeis guineensis* Jacquin.). [**Introduction to the floral biology of the oil palm** (*E. guineensis* **Jacquin.**).]
Publ. Inst. Agron. Congo Belge 1935 : Sér. Sci. No. **5** : Pp. **42**.

A descriptive pamphlet dealing with the specific characters of the oil palm, the number of crowns, the ratio of male to female inflorescences and their morphological organization, with remarks on the various types of sexual expression exhibited.

The scientific value of this plant as material for the study of sex phenomena is mentioned. A bibliography is appended.

1339. BEIRNAERT, A. 633.855.34–1.547.1

Germination des graines d'*Elaeis*. Essais entrepris à Yangambi. (**Germination of *Elaesis* seed. Experiments at Yangambi**).
Publ. Inst. Agron. Congo Belge 1936 : Sér. Tech. No. 4 : Pp. 38.

The question of the defective germination of thin shelled nuts of *Elaeis* var. *tenera* is examined and methods are suggested for raising the germination capacity. Various types of seed beds and their management and methods of seed storage and transport are also discussed.

## RUBBER PLANTS 633.9

1340. DUCKE, A. 633.912(81)

**Revision of the genus *Hevea* Aubl. mainly the Brazilian species.**
Arch. Inst. Biol. Veg. Rio de J. 1935 : **2** : 217–46.

As a result of a rather extensive study of the genus in its natural habitat the author distinguishes only 12 species, of which he gives descriptions and geographic distributions. He considers that *H. brasiliensis* is no more variable than the other species, but only better known.

1341. 633.912:575(49.2)
d'ANGREMOND, A. 633.912–1.557:581.165

A.V.R.O.S.' Hevea-selectie in de jaren 1932, 1933, 1934. (**A.V.R.O.S. Rubber selection in 1932, 1933 and 1934**).
Arch. Rubbercult. Ned.-Ind. 1935 : **19** : 137–70.

This report on selection combines the results obtained from test tappings of clones and the yields from seedlings at Soengei Panjoer, formerly published separately.

The yields from numerous seedling families obtained by controlled and uncontrolled pollination and from clones are described and tabulated from 1921 onwards.

Among the high producing families is AV 275 x 279 obtained from a cross of two mother trees of known ancestry. The cross 279 x 281, though represented by only three trees shewed such a high yield (50·1 grammes per tree per tapping in its seventh year) that a repetition of this cross on a large scale is being considered.

The families from uncontrolled pollination gave surprising results and several are at least equal to clone AV 49.
The yields of many of the AV clones are shewn and their performance in various localities discussed.
In general it may be said that the demand for selected seedlings is increasing and their value is confirmed by the yields of the seedling families discussed.
As regards the clones, allowing for differences in the system of tapping, clone BW 5 was found to yield in its 16th year about 16 kg. per annum. Clone PR 107 equals AV 49. The performance of a number of younger plants is given and the effects of selective thinning on clones and seedlings is discussed.
From the practical standpoint the difficulty of obtaining a sufficient supply of seed of promising young seedlings and the fact that planters must raise it on the estate if a large planting is intended are disadvantages which do not occur with plantations of clones.
In the author's opinion, in spite of the very high average yields obtained from certain seedling families, clones will still continue to play an important role in rubber production. Nevertheless when the stage is reached when such high seedling families shew little variation in their output the advantage of laying down clones will be lessened and the planting of seedling families will become general.
The establishment of seed plots (isolated if possible) is recommended as soon as a particular family has given evidence of high yielding capacity. The method of laying down such a seed plot on an estate plantation is described.
The importance of recognizing that seedling families from uncontrolled pollination may give high yields is emphasized and the planting of progeny from large numbers of mother trees thus pollinated not only reveals the genetically valuable mother trees but also provides new material for clone selection and for further progenies from controlled and uncontrolled pollination.
Finally a large percentage of high yielding families should arise from artificial or other crosses of mother trees that have been tested for the performance of their progeny derived from uncontrolled pollinations.

## FRUIT TREES 634

1342. 634:575
LANTZ, H. L. 634.11:575.252:575.061.6
**Tree fruits for Iowa.**
Bull. Ia Agric. Exp. Sta. 1935 : No. 341 : 69–112.
A bulletin intended to assist orchard fruit growers in the selection of suitable varieties. Information is given on old and new varieties and hybrids of apples, pears, peaches, plums and cherries, with a note on red colour sports in various apples.

1343. RUBTSOV, G. A. 634:575.127
**(The main points in the life and creative activity of I. V. Michurin).**
Bull. Appl. Bot. Leningrad 1935 : Ser. A (15) : 8–11.
A brief but exhaustive review of Michurin's work and achievement.

1344. HASAN–ENIKEEV, and TSEKHMISTRENKO, P. E. 634:575.127(47.7)
**(I. V. Michurin's varieties in the Ukraine).**
Naučnoe Plodovodstvo (Scientific Fruit Growing. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1935 : No. 5 : 9–16.
Data are given on the behaviour of a number of Michurin's hybrid fruit trees in various localities in the Ukraine, special attention having been given to their winter-hardiness. The Michurin varieties, especially in the case of pears and plums, were distinguished by a high degree of winter-hardiness in comparison with the earlier varieties grown. The date of maturity, time of coming into bearing, productivity and quality are also reported.

1345. YARNELL, S. H. 634:575.252:575.42
**Pedigree nursery stock from the standpoint of heredity.**
Proc. 3rd. Annu. Tex. Citrus Inst. 1934 : 22–26.
The differences between sexual reproduction and vegetative propagation and the nature of bud mutations are briefly described. Since bud mutations for the most part have a deleterious effect on yield it is emphasized that nursery stock should be selected from high-yielding trees.

1346. STANER, P. 634–1.524.4(67.5)
Plantes Congolaises à fruits comestibles. (**Congoland plants with edible fruits**).
Publ. Inst. Agron. Congo Belge 1935 : Sér. Sci. No. 4 : Pp. 56.
The various species of wild fruits found in the Belgian Congo are described. The native names are given together with an analytical key by means of which the indigenous fruits can be easily identified, the genera being distinguished by characteristics based almost solely on the nature and appearance of the fruits.
A list of vernacular names, with the Latin equivalents and an alphabetically arranged index of family, genera and common names conclude the publication.

1347. KEMMER, E. 634–1.541.1:575
Stand der Unterlagenforschung im Obstbau. (**Position in the research on stocks in fruit culture**).
Forschungsdienst 1936 : **1** : 268–84.
A summary of the trend of work on fruit stocks from 1920–1935 based on a bibliography of 304 references. Among the problems treated are the testing of seedling stocks, clones and their standardization and uniformity, methods of multiplication and of obtaining varieties that can be propagated on their own roots, effects of stock and scion upon each other and breeding for various morphological and physiological characters, e.g. the capacity for rapid multiplication and cold resistance.

1348. SCHWECHTEN, A. 634–1.541.1:632.111
Untersuchungen über die Kältefestigkeit von Obstunterlagen. (**Investigations on the cold resistance of fruit rootstocks**).
Gartenbauwiss. 1935 : **9** : 575–616.
The effects of artificial freezing on a number of clones and seedlings of apple, pear, quince and plum rootstocks were observed and are described in detail. The effect of a particular temperature was very different according to the previous temperature conditions to which the plants had been subjected and according to the place where they had been grown, though the relative order of the numbers according to hardiness remained the same. Tests can therefore be made only on plants which have all been reared under identical conditions. The experiments also shewed the importance of having a suitable combination of temperature and duration for the tests in order to obtain a true representation of the resistance of the plant tested; insufficiently low temperatures may have a stimulating effect.
In addition to the degree of hardiness, the capacity for root regeneration after frost damage is also recorded in respect of the hardiest numbers. Observations were also made on a number of seedlings of wild pears, apples and quinces. These shewed much greater variation than the clones and selection of the hardiest was made in three successive winters.
The correlation of various factors with cold resistance was examined; e.g. low water content, and possibly high sugar (monosaccharides and total sugars in the fresh juice or dried material), N and ash content shewed a certain amount of direct correlation with hardiness, whereas osmotic pressure was sometimes direct and sometimes indirect. The various factors, external and internal, which affect the cold resistance are described and the conclusion reached that the present knowledge is far from complete enough to make indirect methods reliable in determining hardiness for breeding purposes.

1349. TUKEY, H. B. 634–1.541.11:581.165:575
**The problem of better rootstocks for fruit trees.**
Proc. 81st Annu. Mtg. N.Y. St. Hort. Soc. 1936 : 150–56.
The commoner types of rootstock in use in the United Stated of America for different fruits are mentioned and their drawbacks briefly indicated.
After mentioning the possibility of breeding uniform seedling rootstocks by plant breeding methods, the author considers the possibilities of vegetatively propagated rootstocks such as are produced at the East Malling Research Station. Apart from their uniformity they possess advantages in that resistance to particular diseases or unfavourable conditions and different degrees of dwarfing can be produced and kept constant.

1350. REBOUR, M. 634.00.14(61.1)
Amélioration de la production fruitière en Tunisie. (**The improvement of fruit production in Tunisia**).
Tunisie Agric. 1935 : **36** : 73–79.
The ways and means necessary to produce fruit of a more standard quality are discussed. These include the establishment of orchards, where selection can take place and where suitable trees and cuttings can be grown to become mother trees, and provision for cultural experiments.

1351. KIRILLOV, F. F. 634.1–1.524.4(47)
(**The variability of the wild forms of apples and pears in theVoronesh district and the preliminary arrangement into groups**).
Naučnoe Plodovodstvo (Scientific Fruit Growing. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1935 : No. 5 : 47–55.
Examinations have been made of the wild apples and pears that grow on the hillsides and in the valleys of the Voronesh district, and which display great variation in type both of the tree and of the fruit. Over 200 different forms of apples have been described as a result of these collections, some suitable for breeding purposes, others for preserving and some for dessert. The most interesting of these are mentioned. Many of these are thought to be the products of natural hybridization between cultivated varieties and the local wild forms. Some of the latter are also described.

1352. GARDNER, V. R. 634.11:575
**Trends and adjustments in the fruit industry.**
Proc. 81st Annu. Mtg. N.Y. St. Hort. Soc. 1936 : 189–202.
Tests at the Michigan Station have indicated that within the standard varieties of apples there are strains differing in value. In the near future it should be possible to obtain superior strains of every prominent apple variety and it is suggested that the growing of such strains is one of the methods whereby growers can increase their profits.

1353. TUKEY, H. B. 634.11:575
**How a new variety of apple originates.**
Proc. 81st Annu. Mtg. N.Y. St. Hort. Soc. 1936 : 209–13.
A popular account of sexual reproduction and controlled pollination.

1354. ISAUEFF, S. I. (ISAEV) 634.11:575.127(57)
(**Michurin varieties in Siberia**).
Naučnoe Plodovodstvo (Scientific Fruit Growing. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1935 : No. 6 : 3–11.
One of the few apples capable of growing in Siberia without a covering of snow is the variety Taežnoe, produced by Michurin from a cross between Candille-Kitaika and *Malus baccata*. This variety bears fruits which, though small, are not inferior to the average Reinette in quality and are possessed of excellent keeping capacity. Higher quality still distinguishes the variety Kitaika Zolotaja Rannjaja (Early Golden Chinese) which is also very early in maturity and almost equally hardy. These, together with the variety Ermalo, which was distinctly less hardy, were

the only apples produced by Michurin capable of growing in such exposed conditions and the older varieties were also entirely destroyed by the frost.
It has been found that by training the bushes so as to grow more or less horizontally close to the ground level they are protected from the winter frosts ; several of the Michurin varieties were found suitable for this type of cultivation and their characteristics are described.

1355. Dorsey, M. J. 634.11:575.252:581.162.3
**The results to date of four lines of research of special interest to apple growers.**
Trans. Ill. Hort. Soc. 1935 : **69** : 236-46.
One of the problems reported is fruit setting in bud sports ; it has been found that for the most part bud sports in apples have the same pollination requirements as their parent varieties.

1356. Kelley, V. W. 634.11:575.252.061.6
**Factors affecting the development of color in fruits.**
Trans. Ill. Hort. Soc. 1935 : **69** : 430–40.
One of the suggestions for improving colour in apples is the planting or top-working of red sports in preference to the standard varieties.

1357. Krumbholz, G. 634.11:581.46:575.1
Beiträge zur Morphologie der Apfelblüte. I. Mitteilung. Uber die Zahl der Samenanlagen in den Blüten in ihrer Abhängigkeit vom Genotypus und der Stellung der Blüte im Blütenstand. (**Notes on the morphology of the apple flower. 1st communication. On the number of ovules in the flowers and its connexion with the genotype and the position of the flower in the inflorescence.**)
Gartenbauwiss. 1935 : **9** : 509–57.
Large plantations of the varieties Weisser Klarapfel, Charlamonsky, Manks Küchenapfel and Winter-Goldparmäne growing side by side in identical conditions were examined for the number of ovules per flower in the central flowers of the inflorescence. This number was seen to be distinct and characteristic for each variety. These flowers always contained more than the side flowers, and in extreme cases the maximum for the latter might be about 10, whilst the central flowers contained up to 20. In other varieties the number was more nearly equal. The number is also influenced by various external factors, including the rootstock, and by the position of the inflorescence on the tree. Nevertheless a detailed examination of a number of varieties shewed the number of ovules per carpel and per flower in the different flowers of the inflorescence to be a fixed varietal character and the varieties could be divided into a number of groups and subgroups according to this character. The results are presented in the form of tables.
Similar examinations were made on a number of other *Malus* species and hybrids, including *M. baccata, M. cerasifera* Wenzig (*M. baccata* x *prunifolia, M. robusta* Rehder), *M. Hartwigii* (*Halliana* x *baccata*) Koehne, *M. prunifolia, M. ringo fastigiata bifera* Dieck. (*Ringo* x ? *pumila* Koehne) and *M. zumi* (*baccata* x *Sieboldii* ?), where more or less the same differences could be observed.
Differences in number of carpels per flower were also observed, the carpel number varying from 3 to 7. These differences were also characteristic of varieties and the two characters taken together form a useful additional feature in making a varietal classification. It is possible these characters will also give indications of the phylogenetic and genetical relationships of the varieties. So far no connexion with chromosome number has been observed.
All pear varieties examined had the normal number of 5 carpels with 2 ovules each.

1358. Evreinoff, V. A. 634.11–1.541.11:551.563
Il *Malus baccata* come porta innesto in montagna. (***M. baccata* as a stock for mountainous districts**).
L'ortofruttic. Italiana 1935 : **4** : p. 196.
The present article represents notes from the author's paper in the " Revue Horticole Suisse " which deals with the value of *M. baccata*, particularly f. *genuina vera* as a stock for districts where hardiness is required. Besides withstanding temperatures of −45°−50°C. it is resistant to fungus and other pests and especially to *Schizoneura lanigera*. It is not a very vigorous grower and does not make great demands on the soil. The best scions are Red Astrakan, White Transparent, Borovinka, Skrijapel, Antonovka, Northern Spy, MacIntosh, Gravenstein and Reinette de Lansberg.

1359. 634.11–2.42–1.521.6:581.45
Keitt, G. W. and Nusbaum, C. J. 632.42:576.16:634.11
**Cytological studies of the parasitism of two monoconidial isolates of *Venturia inaequalis* on the leaves of susceptible and resistant apple varieties.**
Phytopathology 1936 : **26** : 97–98. (Abst.)
Isolate 22a parasitized the variety Yellow Transparent vigorously and Fameuse moderately, 17a parasitized Yellow Transparent moderately and Fameuse vigorously, while Missouri Pippin was resistant to both isolates.
In all cases infection took place but cell injury and the growth of the fungus were restricted in proportion to the resistance of the variety to the isolate concerned.

1360. Natividade, J. V. 634.13:576.312.35
Investigacões citológicas em variedades culturais de pereiras (***P. communis* L.**).
**[Cytological investigations on cultivated varieties of pears (*P. communis* L.).]**
Bol. Soc. Broteriana 1935 : **10** : 195–203.
Pollen-mother-cells were examined and chromosome counts taken for ten Portuguese varieties, six of which proved to be diploid and four triploid. The former had perfectly normal meiosis, the triploids however displayed the usual irregularities, which are described. One triploid variety, Leitão, had a much larger number of univalents than any of the others, the number commonly rising to 10 or 12, and this was found to be due to a greater tendency for the trivalents to separate into one bivalent and one univalent in this variety. This led to a greater proportion of abnormal tetrads.

1361. Esmarch, F. 634. 13–2.42–1.521.6
Weniger bekannte Blattfleckenkrankheiten der Birne. (**Little known leaf spots of pears**).
Kranke Pflanze, 1935 : XII : **9** : 129–32.
Descriptions are given of the leaf spot caused by *Mycosphaerella sentina* and certain varieties known to be resistant are mentioned, most of which have the defect, however, of being susceptible to scab.
Varieties are also mentioned which are resistant or immune to attack by *Stigmatea mespili*, whereas attack by the rust *Gymnosporangium sabinae* is said to be best avoided by removing the alternate hosts.

1362. 634.14
Korbon, R. Ja. 634.14:575
(**The quince**).
Bull. Appl. Bot. Leningrad 1934 : Ser. 8 (3) : 113–57.
A review is given of information on the genus *Cydonia* based on data in the literature and observations of the Institute of Plant Industry, Leningrad. The systematic position of the genus and its various species is described, reference in this connexion being made also to the neighbouring

genera *Chaenomeles* and *Docynia*. Studies of the geographical distribution have revealed great variation in the wild quinces of the Caucasus and the neighbouring regions along the southern Caspian shores in respect of fruit and leaf characters, time of ripening, and many other characters. There is little doubt that this small area represents the centre of origin of the common quince from which it has spread to all other countries. A brief historical outline of the introduction of it into a large number of countries throughout the world is given. Similar data are given for the endemic Japanese equivalent of the quince, *Chaenomeles* Lindl., which in the U.S.S.R. has proved somewhat more hardy than the common quince, *Cydonia oblonga*.
The morphology of the flowers and fruits, the biology of flowering and the cultivation of quince in different countries are next considered, followed by a brief review of the work done on breeding. Very little change has been brought about in the characters of the quince by cultivation, except the increase in the size of the fruits. This could probably be carried much further by crossing with the Chinese quince, *Cydonia sinensis* Koehne, which has very much larger fruits weighing up to 4kg. The Americans have produced varieties possessed of hardiness, or early maturity or fine aroma and some of the varieties produced in Russia by selection from the local forms of the Caucasus and Central Asia are deserving of attention. Some of the latter are extremely fine flavoured and can even be eaten raw. The Astrakhan varieties are distinguished by considerable resistance to frost but the hardiest of all so far is the quince produced by Michurin. There still remains much to be done in the direction of drought and cold resistance and in improving the quality, in which latter respect crosses with the apple are recommended.
After giving some tabulated data on the chemical composition, the article closes with an extensive bibliography.

1363. 634.22:575.129:576.16
RYBIN, V. A. 634.22:575.127.2:576.356.5
**(An experiment on the synthesis of the domestic plum from related wild species).**
Bull. Appl. Bot. Leningrad 1935 : Ser. A (15) : 87–100.

The author cites the remarks of Crane and Lawrence in which it is concluded on genetical grounds that the domestic plum, *Prunus domestica*, has originated as an amphidiploid hybrid from *P. cerasifera* (syn. *P. divaricata*) and *P. spinosa*. It is further pointed out that the occurrence of *P. domestica* in the wild state in the Caucasus, where it is supposed to have come from, is extremely doubtful. The Soviet expedition to the Caucasus found neither *P. domestica* nor its subspecies *P. institia*. Cytological examinations were made of 69 specimens of the wild and cultivated varieties of *P. cerasifera* collected in the Caucasus. Most of these proved diploid, but three triploids occurred and one with 48 chromosomes.
In 1933 crosses were made between a number of these forms of *P. cerasifera* and the tetraploid *P. spinosa*, both of which were growing wild together in the North Caucasus. On choosing the forms for hybridization however, several natural hybrids between the two were discovered amongst them, their hybrid nature being first made evident by the intermediate nature of their flowers. Their pollen was examined and seen to be very irregular in shape and mostly sterile, evidently owing to the triploid nature of the plants, which was confirmed in root tip counts in which the number 24 was established. In spite of abundant flowering the trees were nearly sterile, one tree producing six and another seven fruits in 1934. The form of the fruits and stones was also intermediate, as were the leaves and other vegetative features. Further examinations disclosed the existence also of a certain number of fertile hybrids and in 1935 these were examined cytologically, on the assumption that they would probably prove to be hexaploid. The results will be reported later.
The crosses made in 1933 produced 450 hybrid fruits, from which however only 16 seedlings were raised. One of these however actually proved to be the expected amphidiploid with 48 chromosomes. This plant was produced by pollinating one of the wild trees of *P. cerasifera* with *P. spinosa*, 824 flowers being pollinated and only 13 fruits obtained ; 12 of these were sown and only one germinated, this being the plant that proved to be amphidiploid. All the other seedlings obtained had 24 chromosomes and closely resembled the natural hybrids. The hexaploid, however, was distinguished by darker green leaves, more rapid development, larger and broader

leaves which also differed in form, larger cells, nuclei and chloroplasts, absence of pubescence on the young shoots and the colour of the bark. In all these features the hexaploid resembled the domestic plum.
In addition to its interest in demonstrating the origin of *P. domestica*, the amphidiploid hybrid is of importance in the possibility it offers of hybridizing with *P. domestica* and thus introducing into this latter species the characters of *P. cerasifera*, a thing that has not been possible hitherto on account of the intersterility of the species.

1364. DAHL, C. G. 634.22:581.46:575
**Morphological studies of plum flowers.**
Årsskr. Alnarps Landbr.- Mejerioch Trädgårdsinst. 1935 : Pp. 93.
This monograph which is in English follows closely the lines of the paper abstracted from the Swedish under Abst. 1365 below.

1365. DAHL, C. G. 634.22:581.46:575
Blomkaraktärernas betydelse för identifiering av plommonsorter. (**The importance of the flower characters for the identification of varieties of plums**).
Sverig. Pomol. Fören. Årsskr. 1936 : **37** : 1–52.
This paper contains comprehensive descriptions (with illustrations) of the flowers of the 40–50 varieties of plums most important for Swedish horticulture, with an analytical table for use in the identification of the different varieties from the characteristics of their flowers.

1366. 634.22–2.472.3–1.521.6
BROOKS, F. T. 634.97–2–1.521.6
**The resistance of trees to " ligneous " fungi.**
III Congr. Int. Path. Comp. Athènes 1936 : Pp. 10.
Observations on fungi which infect trees through exposure of the wood and which spread mainly in the xylem. Data on the resistance or susceptibility of the Pershore and Victoria plums (*Prunus domestica*) at different seasons by *Stereum purpureum* indicate that resistance to infection of wood tissues is connected with the gum formation process as a reaction to the presence of the fungus. The difference between susceptibility and resistance is not absolute, but apparently depends on the degree and perhaps the quality of gum formation.

1367. 634.25 Candoka
634.25:581.162.5:575.252
634.13:581.162.3
**Pollination studies made of fruits.**
Northw. Fruit Gr. 1935 : **7** : p. 5. col. 4.
In connexion with studies of pollination in peaches and pears, the new peach Candoka—a bud sport or mutation of the J. H. Hale—is under observation to ascertain whether it tends to be self-sterile like its parent.
Pollination studies of d'Anjou pears are also being made.

1368. HAVIS, L. 634.25:575(77.1)
**Some newer peach varieties.**
Proc. 69th Annu. Mtg. Onio St. Hort. Soc. 1936 : 112–14.
Remarks on some of the newer, earlier, and hardier varieties of peaches, chiefly based on the favourable season of 1935 ; in particular Pioneer, Cumberland, Golden Jubilee, Oriole, Eclipse and Vedette and others have shewn promise.

1369. DUCOMET, V. 634.25:575.42(44)
Le pêcher dans le Sud-Ouest. (**The peach in the South West**).
Sélectionneur 1935 : **4** : Fasc. 3–4 : 6–16.
Part II of this paper describes a selection experiment to improve the quality of peach trees setting out from a good tree of unknown origin and variety and using sexual reproduction.

1370. BLAKE, M. A. 634.25–2.111–1.521.6:575
**A problem in varietal hardiness in peaches.**
N.J. St. Hort. Soc. News 1936 : **17** : pages 796, 809.
Statistics of the number of fruit buds found to be alive on different varieties of peach trees in the late winter of 1936 in New Jersey orchards have shewn that two varieties may be approximately equally " hardy in bud " in one orchard but not in another. Also a single tree of a new variety might be bud hardy in the soil and site where it originated but not specially so grown only a short distance away. Varieties of apples and peaches have also been shewn to vary in their response to environment and nutrition but the effect of such factors on the hardiness of fruit buds still requires investigation.

1371. BLAKE, M. A. 634.25–2.111–1.521.6:581.02
**Nineteen types of varietal hardiness of the peach.**
N.J. St. Hort. Soc. News 1936 : **17** : pages 797, 803.
Numerous ways in which the varieties of peaches and even the parts of the tree may differ in resistance or susceptibility to unfavourable environmental factors are enumerated.

1372. LUSS, A. I. 634.3:575(47)
(***Citrus* introduction and selection in the U.S.S.R.**)
Soviet Subtropics 1935 : No. 11 (15) : 17–27.
The *Citrus* collection in 1935 consisted of over 550 specimens from all the main *Citrus* countries of the world. The main lines of improvement aimed at in the different species are outlined, in which connexion special mention is made of the most hardy representatives of each group. During the period 1930 to 1932 crosses were made between representatives of 123 varieties belonging to eighteen different species and three distinct genera, about 500 combinations in all having been made, involving the pollination of 107,700 flowers, from which 35,300 hybrid plants were obtained. About 3,000 of these were true hybrids and another 1,000 were obtained in 1934. A table is given shewing the different combinations made. The hybrids of *Poncirus trifoliata* have proved hardy and shew a certain amount of variation, so that selection can be started in the $F_1$. The first generation hybrids are of no commercial value however. On the other hand some of the hybrids of the kumquat and the lemon are promising even in the first generation and observations so far indicate that these hybrids are hardier and have slightly larger fruits than the limequats. Promising hybrids have also been produced by crossing the hardiest of the mandarins with the hardiest known oranges and pomelos.
Chromosome counts have been made in the pollen of 28 forms representing 13 different species, all having the same number, n = 9, and similar observations are now being made on the hybrids. A triploid plant with 36 chromosomes has been observed among the hybrids of the Satsuma with the Turkish orange and two plants with 27 chromosomes appeared in a cross between the orange and citron and a polysomic with 28 in the hybrids of the Novoafon lemon with Meyer's Chinese lemon.
Certain forms have proved very unfavourable for use as female parents on account of their high proportion of apogamous seedlings, sometimes amounting to 100 per cent ; among these are *C. Unshiu* Marc., *C. deliciosa* Tan., *C. sinensis* Ost. and *C. Paradisi* Macf. The lemon (*C. limonia* Osb.) and the citron (*C. medica* L.) on the other hand, which rarely have more than two embryos, give a high proportion of hybrid seedlings, up to 90 per cent or more. *P. trifoliata* also forms a small number of embryos and is in this respect therefore a suitable parent. Many hybrids, though having large numbers of embryos, when pollinated with another form usually give 100 per cent hybrid seedlings and no apogamous embryos at all. Their heterozygous nature is thought to be one of the reasons for this propensity for hybridization. In general, heterosis is a very marked phenomenon in the *Citrus* hybrids and the greater survival of hybrid seedlings on crossing is also regarded as the reason for the greater variation of the seedlings of many of the crosses than among the selfed seedlings of the forms from which they were obtained. The frequent appearance of plants with three and five lobed leaves among these hybrids is taken as an indication that the original ancestors of the *Citrus* fruits were of this type and moreover a vegetative mutation from the three to the one-lobed condition was observed in a hybrid of orange x *P. trifoliata*.

Study of the hybrids of the lemons *Ponderosa* and *Melarosa* and the pomelo Asahikan have given clear indications that these three forms are interspecific hybrids and not pure species, while various other forms have equally definitely shewn themselves to be not hybrids and to be worthy of specific rank.
Various chimaeras have been produced from grafts between different species. Much earlier flowering has been induced by bud-grafting on to mature trees and the various factors inducing early flowering in hybrids are being investigated

1373. MURRI, N. M. 634.3:575(47)
**(Selection of citrus plants in the Batum Botanical Garden).**
Soviet Subtropics 1935 : No. **9** (13) : 72–73.
Breeding work was started in 1934, the main problems being to create frost-resistant forms of lemon, orange and pomelo, using the most hardy species such as *Poncirus trifoliata*, *Fortunella*, etc. and crossing them with the best commercial types. In 1934 about 5,000 crosses were made and 10,000 in 1935.
A certain amount of success has been achieved with a chemical method of distinguishing between hybrids and apomictic seedlings.
Cytological work is also in progress, including attempts to obtain forms with aberrant chromosome numbers, and the production of artificial mutations.

1374. 634.3:575(76.4)
BAKER, S. 634.323 Ruby :575.252.061.6
**The more profitable citrus varieties for the valley.**
Proc. 3rd. Annu. Tex. Citrus Inst. 1934 : 15–20.
The following varieties are recommended for the Rio Grande Valley : the Marsh Seedless grapefruit, Surprise I Navel orange, with Hamlin or Norris Seedling as extra early and Valencia or Lu Gim Gong as late varieties respectively, Wanurco tangerine, Meyer's Chinese lemon and the Mexican or Key lime.
Two bud mutations from the Thompson or Pink Marsh Seedless grapefruit are mentioned, each having red flesh and a pink blush on the outside ; one has been named Ruby and the other Webb's Redblush Seedless (Cf. Abst. 1385).

1375. HALSTEAD, E. W. 634.3:575(76.4)
**Some citrus varieties in the lower Rio Grande Valley.**
Proc. 2nd Annu. Tex. Citrus Inst. 1933 : 87–91.
Over 40 varieties of grapefruit, orange, tangerine, mandarin, lemon and lime are mentioned, with brief indications of their behaviour in the Rio Grande Valley.

1376. 634.3:575.127(47)
RINDIN, N. V. 634.3:576.356.5
**(Selection of citrus plants).**
Soviet Subtropics 1935 : No. **1** (5) : 22–29.
The author shews that the introduction of varieties from abroad cannot provide a solution to the problem of *Citrus* growing in the Soviet subtropics, in particular the problem of frost resistance. The production of hardy clones by bud selection seems equally unpromising. Breeders are forced therefore to turn to hybridization. Crossing within the species is applied relatively little, as in most cases the species does not contain members of the desired type ; this method is applied only in the orange, where the best quality varieties are crossed with the hardy variety 511, in pomelo, which is crossed with the hardy but almost inedible Japanese variety Natsu-mican and others, and in lemon, where Meyer's Chinese lemon is used as a hardy parent. Interest mainly centres in interspecific and complex crossing. Rather than direct crossing with *Poncirus trifoliata*, whose hybrids are all of low quality, it is recommended that use be made of the already existing hybrids of this species and of *Fortunella* made in America, for crossing with the best commercial *Citrus* forms.

Hybridization work was begun in 1930 and in 1933 as many as 12,000 crosses were made, 52,000 in 1934 and 60,000 were planned fror 1935. Owing to deficiency of other material the greatest numbers of crosses were done with the Satsuma, which gave a very low proportion of hybrid seedlings per pollination (0.15 per cent). Some of the hybrids are illustrated. These include a hybrid of lemon x *P. trifoliata* shewing leaf characters belonging to both parental species. The hybrids are grafted on to *P. trifoliata* to induce the earliest possible flowering and maturity and are to be back-crossed on to the cultivated forms.
A search is being made for polyploid forms, largely in the desire to obtain sterile (seedless) triploids and other forms with unbalanced chromosome number ; and a tetraploid seedling of the mandarin has been found in the progeny of the cross of Satsuma x Natsu-mican, also a triploid lemon seedling from the cross of the local lemon Il'ič with Meyer's Chinese lemon.

1377. SUKHENKO, G. 634.3:575.127(47)
**(Hybridization of *Citrus* in the sovkhoz Lenin).**
Soviet Subtropics 1936 : No. 4 (20) : p. 68.
With the object of producing more frost-resistant forms of the mandarin orange pollinations were made in 1935 of the Satsuma, using pollen from the most frost-resistant forms present—the Turkish orange, Shius Mikan, Natsu-mikan and the shaddock ; pollen of other species such as the citron, lemon and orange was also used, 3,423 flowers in all being pollinated. The average success amounted to 19·7 per cent. The seeds will be dealt with according to the methods of I. V. Michurin.

1378. 634.3–1.541.1:575
TOXOPEUS, H. J. 634.3–2.411.4–1.521.6:575
Die Züchtung von Unterlagen für *Citrus sinensis* Osb. immun gegen *Phytophthora parasitica*, die Ursache der " gum-disease " in Java. (**The breeding of stocks for *C. sinensis* Osb. immune to *P. parasitica*, the cause of gum disease in Java).**
Züchter 1936 : **8** : 1–10.
After experiments in which *C. Aurantium* proved a failure as a source of stocks for grafts of *C. sinensis*, breeding operations were begun with the object of producing stocks which would be suitable for *C. sinensis* and whose seedlings should be ready to be grafted after 1–1½ years of age. Crosses were made between representatives of (1) species and varieties that are immune though unsuitable as stocks for *C. sinensis* and (2) susceptible rapid growing forms (mostly untested as stocks) and also within these two groups. The methods used in artificial crossing are mentioned and a composite table is given of data from various workers (including the author) shewing percentages of the sexual hybrids produced by the different species. Polyembryony, though a drawback in the production of hybrids, offers an excellent way of reproducing heterozygotes vegetatively. Incidentally some data are presented to shew the variation in the number of hybrids produced in crossing the Japanese lemon (*C. hybridus*) by various other species. Data are also given shewing the very large numbers of crosses necessary in the case of some species (e.g. 5,680 in the case of *C. nobilis*) in order to obtain 1,000 hybrids.
All *Citrus* species cross readily *inter se* and crosses have been successful between *Citrus* species and varieties of *Poncirus* and *Fortunella*, while the author even succeeded in crossing *C. aurantifolia* with *Murraya paniculata* though the hybrids were malformed.
The various crosses made between *Citrus* species by the author in 1929 and earlier are shewn. Only one pair of parents namely *C. decumana* and *C. medica* showed differences in the reciprocal cross but thorough investigation of this case was not possible as the $F_1$ plants obtained from *C. medica* x *C. decumana* were very poor and did not flower.
The records of the grafting of the hybrids with *C. sinensis* shew that only very few of these form suitable stocks for this species, most of the trees (including the grafts on *C. Aurantium*) having become sickly and died off after a longer or shorter period and *C. sinensis* may be regarded as particularly specialized as regards a suitable stock.
The difficulties of testing individual *Citrus* trees for resistance to *Phytophthora* are mentioned. Among the 1929 series of hybrids from the cross of immune x susceptible types several have

already revealed disease symptoms and it is possible that the search for immune stocks may have to be continued into the $F_2$. For this purpose some of the seeds from the $F_1$ hybrid Japanese lemon (*C. hybridus*) x djeruk Keprok (*C. nobilis*) have been sown.
Out of 235 two-year-old grafts on the hybrids of 1931, 40 failed as grafts on the Japanese lemon. Of the promising young plants of which the stock failed as a graft on the Japanese lemon, root cuttings are being raised from which as soon as possible grafts or buddings will be taken.

1379. 634.31 Trovita
634.31:575.242
634.322:575.12

**From a few seeds, found by chance in a fruit of the normally seedless-type Washington navel orange.**

Science 1936 : **83** : (Suppl. No. 2151) : p. 10.

From a few seeds found by chance in a normally seedless Washington navel orange a new variety " Trovita," has been developed by the California University Citrus Experiment Station. Three new citrus fruits, two of which are hybrids between separate varieties of mandarin oranges and the third a hybrid between Satsuma and mandarin are mentioned. (See Abst. 1382).

1380. Traub, H. P. 634.32:581.3:575.127.2

**Artificial control of nucellar embryony in citrus.**

Science 1936 : **83** : 165–66.

The inherited tendency in citrus to produce supernumerary nuclear embryos, which renders the study of the progeny in breeding experiments difficult, may be counteracted by decreasing the food supply of the pericarp. Such " starvation " treatment of sweet orange, sour orange and grape fruit and various varietal crosses gave pale yellow fruits weighing only about one third of the weight of untreated fruits ; and the number of seeds producing more than one embryo was from 51–100 per cent below the expected number.
Self-pollinated sour orange and grapefruit segregated for leaf characters, sweet orange and intermediate types being observed in both cases. This tends to confirm the view that grapefruit and sour orange are natural hybrids with the sweet orange and that the progeny in most cases is the result of sexual reproduction.
Further work is in progress.

1381. 634.322

Lacarelle, A. and Miedzyrzecki, C. 634.322:581.48–184

Contribution à l'étude du Clémentinier au Maroc et, en particulier, de la question " présence ou absence de pépins." (**A contribution to the study of the variety Clementine in Morocco and in particular of the question " presence or absence of pips."**)

La Terre Marocaine 1936 : (January) : 19–25.

The variety in question, a hybrid between the mandarin and a variety of the bitter orange known as Granito, is described.
There was a noticeable variation in the number of pips in the fruit and observations and experiments shewed that pollination by neighbouring mandarins resulted in the presence of numerous pips while with self-pollination the fruits were more or less seedless.

1382. 634.322:575(79.4)

Frost, H. B. 634.31:575(79.4)

**Four new citrus varieties—the Kara, Kinnow, and Wilking mandarins and the Trovita orange.**

Bull. Calif. Agric. Exp. Sta. 1935 : No. 597 : Pp. 14.

The four varieties, which were produced at the University of California Citrus Experiment Station, Riverside, are being introduced for preliminary trials only and are given full descriptions in this bulletin.

The Kara mandarin is an $F_1$ of the cross Satsuma x King mandarin and is particularly good for juice. It produces 3·2 embryos per seed and seedlings from self or cross-pollination are nearly all nucellar in origin. Seeds in the fruit are medium in number.
The Kinnow mandarin is an $F_1$ of the cross King mandarin x Willow Leaf (China) mandarin. Its fruit is excellent in flavour until the acidity becomes too low with over-ripeness. The seeds are medium in number and contain an average of 2·7 embryos.
The Wilking mandarin is another $F_1$ from the same cross as Kinnow from which however it differs in many ways. Its seeds are medium in number per fruit and produce only one embryo as a rule ; seedlings from self-pollination are nearly all of sexual origin.
The Trovita orange is a good, early, non-navel orange which has pollen and a few seeds. It has been developed from three original seedlings, doubtless nucellar in origin, grown from seed found in one fruit in the main Washington Navel orange crop of 1914–15. There are two strains, one with more seeds than the other ; the latter is rather subject to bud variation and it is recommended that budwood for trial should be taken only from the former strain called B11, 12.

1383. Zorin, F. M. 634.322:581.331.23
**(Germinating the pollen grains of Satsuma).**
Soviet Subtropics 1936 : No. 4 (20) : 66–68.
As a result of a severe drought many *Citrus* species, and in particular the Satsuma, came into abundant flower a second time during the growing season of 1935. The pollen produced in this second flowering shewed a germination percentage of 16·4 per cent as compared with the normal low figure of 0·6 per cent. In this way enough pollen can be obtained to pollinate other species and it is proposed to apply the method to other *Citrus* species.

1384. Shamel, A. D. 634.323:575.252:575.42
**Bud variation in Marsh grapefruit.**
Proc. 2nd Annu. Tex. Citrus Inst. 1933 : 41–53.
Grapefruit cultivation in California and Arizona is founded on the Marsh Seedless variety and the consequent importance of the conservation and improvement of this variety has led to systematic studies being made from the point of view of bud variation and bud selection.
Examples are given of the type of bud variation which can occur and the methods of detecting them, by individual tree records and testing them by bud propagation, are outlined.
By systematic application of these methods the increase of superior strains and elimination of inferior strains can be ensured, with consequently increased production of desirable fruits.

1385. Webb, J. B. 634.323 Webb's Redblush Seedless:575.252.061.6
**History and description of Webb's Redblush Seedless grapefruit.**
Proc. 3rd. Annu. Tex. Citrus Inst. 1934 : 20–21.
The new variety originated as a bud mutation in a Pink Marsh tree budded in May, 1929 and frozen back to within about two inches of the bud union in January 1930. The shoot which emerged from the remaining stump bore the mutant type of fruit, which has deep red flesh, the colour shewing through the peel to form a blush on the outside of the fruit. The type has remained true after several different vegetative propagations and so appears to be quite stable. In other respects it resembles the Marsh Grapefruit.

1386. Nikolayev, V. 634.418
**(Asimina—a new fruit plant).**
Soviet Subtropics 1936 : No. 2 (18) : 52–55.
A description is given of the fruit *Asimina triloba*, which is of great promise in the Soviet subtropics because of its capacity to withstand up to 7°C. of frost. Varietal differences have been observed in number of seeds per fruit, indicating the possibility of breeding forms with lower seed number.
Data on yield and chemical analyses of fruit are presented.

1387. ZARETSKY, A. Y. 634.451
**[New varieties of the Japanese persimmon (the Kaki).]**
Soviet Subtropics 1935 : No. **3** (7) : 69–70.
One of the main obstacles to the extension of cultivation of the Japanese persimmon is its bitter flavour when immature, which is frequently retained until the fruit is quite soft. There are certain forms free from this bitterness but these are almost entirely female and therefore require pollinators. Hence efforts are being made to produce sweet forms. Varieties were introduced from Japan in 1930 and two of the forms isolated from these are promising, namely Delicious and Twentieth Century, and also the American variety Fujiu.

1388. 634.51:575
KURDIANI, S. 634.51–1.524.4(47.9)
**(Selection of walnuts).**
Soviet Subtropics 1936 : No. 1 (17) : 16–24.
The walnuts of Transcaucasia are characterized by remarkable variability. Variation is observed in a large number of different characters ; thus for example the nuts may be borne singly or in clusters of 2 or 3 or even up to 10–20 in certain forms (*Juglans regia* var. *racemosa*). The fruit varies from 1 to 6 cm. in length, the thickness of shell from 0·8 mm. (var. *tenera*) to 8 mm. (var. *angulata*) ; the thick shelled forms are usually also characterized by high oil content (up to 65–70 per cent). Similar variations are observed in the shape of the nuts, in the number of ribs on the fruit (forms with 1, 2, 3 and 4 exist), the proportion of kernel to shell, colour of shell (white to reddish brown), and colour of the kernel skin, which varies from white to tawny or dark brown : as the light coloured ones fetch a better price breeders should select this type, and also forms from which the kernel is extracted without difficulty. Oil content also varies, forms with 66 per cent of oil and over in the kernels having been found and this could probably be very much increased by breeding. Variation even occurs in the form of the leaves, certain varieties with laciniated leaves having been found. And lastly such characters as yield, time of maturity, cold and drought resistance, etc. shew similar variations.
The nuts from any one tree are very uniform and for breeding purposes it is enough to examine 3–5 nuts from any tree to assess its value.
The use of walnuts for timber is discussed and it is seen that in this respect too great variation exists.
The points that should be possessed by all trees selected for breeding are enumerated. Suitable trees are propagated by grafting on to stocks of either walnut or *Pterocarya caucasica*. In this way large areas of wild *Pterocarya* are to be converted into productive walnut plantations. It is also desirable to graft good fruiting types on to plants of good timber type, so as to combine these two qualities. The work of hybridization is directed towards the production of frost-resistant, drought-resistant, high yielding forms with rapid growth which are at the same time immune to diseases and pests.

1389. KHAR'JUZOVA, E. D. 634.53
**[The chestnut. Review of literature on the genus *Castanea* (Tourn.) Mill.]**
Bull. Appl. Bot. Leningrad 1934 : Ser. **8** (3) : 3–112.
Based on an exhaustive study of the literature, the monograph treats first the systematic position of the genus *Castanea* and the classification of its species. Descriptions, with illustrations, are given of the different species and their varieties. *Castanea* is shewn to be a genus of extreme antiquity and its geographical distribution in the tertiary and later geological periods is described and shewn to have been very much more extensive than at the present time. The relationship of the fossil members to the present-day species is examined and the part played by chestnuts in the ancient civilizations is analysed. The present geographical distribution of the genus is described in detail, first of the European species, then of the eastern Asiatic and the American species.

The ecology of the genus and the genetic variability of the different characters are treated next, followed by sections on the anatomy of the vegetative and reproductive organs and on the biology of flowering. The present position of genetical and cytological studies is outlined, with descriptions of a number of interspecific hybrids. The article terminates with a section on the utilization of the chestnut and an extensive bibliography.

1390. KHARYUZOVA, E. D. 634.533
**(The Japanese chestnut).**
Soviet Subtropics 1936 : No. 1 (17) : 56–60.

The species *Castanea crenata* Sieb. et Zucc., introduced into Russia in 1895, is described. Several varieties of it are present, the characteristic features of which are described. In relation to breeding, the Japanese chestnut has many valuable qualities, such as large size of fruits, their attractive colour, early maturity, low growth, high yield and resistance to fungous diseases and insect pests. The fruits are however somewhat low in quality and to overcome this crosses are to be made with the local wild chestnut, *C. sativa* Mill. and with the American species *C. dentata* Borkh. A low growing, early maturing chestnut of good quality ought to be obtained by this means.

1391. KARMAZINA, I. P. 634.54:575(47)
**(Selection of filberts at the Sochi station).**
Soviet Subtropics 1935 : No. **9** (13) : 55–59.

Hybridization work with filberts was begun at the Sochi station in 1932 with the object of combining frost resistance with the existing desirable qualities of the best local forms, and to increase the size of fruit of some of them while retaining high yield, thin skin, and high oil content. Disease resistance is another direction in which improvement might be effected, whilst the provision of suitable pollinators is a problem of the first importance, since many varieties bear exceedingly few male flowers.

The method used for hybridization is described. In 1933 over 4,000 hybrid nuts were produced, from which 1,550 vigorous hybrids were obtained in the following year. About 6,000 hybrid nuts were produced in 1934 and the work is being continued, using pollen now from Michurinsk and Kuretsev in place of local pollen. *Corylus colurna* is also being used for interspecific crosses.

## GROUNDNUTS 634.58

1392. 634.58:575.42(66.3)
La multiplication des semences sélectionnées au Sénégal. (**The multiplication of selected seeds in Senegal**).
Bull. Inst. Colon. Marseille. Mat. Grasses 1936 : **20** : 29–43.

Improved strains of groundnut have been produced at the station at M'Bambey and these are now being multiplied under official supervision in order to supply seed for native cultivation. A report on this work of multiplication is given in some detail. The new strains represent an improvement in the direction of drought resistance for arid zones, tolerance for zones with poor soil, earliness for zones with short winter, lateness and thick shell for regions with long winter or erectness for cultivation with the plough. Care is taken to test the varieties in the different districts to assure the selection of the strains most suited to each for multiplication and it is reported that the natives are very satisfied with the new strains.

1393. 634.58:575.42(66.3)
La sélection des arachides au Sénégal. (**Selection of groundnuts in Senegal**).
Bull. Inst. Colon. Marseille. Mat. Grasses 1936 : **20** : 85–93.

Selection is now being practised at the Groundnut Research Station at M'Bambey, on the basis of resistance to drought and diseases, genetic purity as regards fruit characters, a high ratio of weight to number of fruits and a high oil content. Selections have been made among 20,000 plants and 750 of them are at present retained, for comparative progeny tests. Comparative tests shewed all the selections to be superior to the local standard in yield, the best of them exceeding it by 29 per cent. The selections were also superior in oil content.

Tests are also made in each separate region so as to produce improved varieties suitable for each district.

1394. Tihon, L. 634.58:575.42(67.5)
Contribution à l'étude des arachides du Congo Belge. (**Contribution to the study of the groundnuts of the Belgian Congo**).
Agric. Élev. Congo Belge 1935 : **9** : 118–19, 136–37.
Studies of the local groundnuts have shewn the existence of great variation in weight and number of seeds per pod, and oil content ; some of the varieties are of exceedingly high oil content, equal to the best foreign varieties and it is recommended that selection be carried out to isolate these types.

## VARIOUS TREE FRUITS 634.65

1395. Schubert, N. 634.65:577.16
**(A new raw material rich in vitamin C.).**
Naučnoe Plodovodstvo (Scientific Fruit Growing. Bull. Lenin Acad. Agric. Sci., Res. Inst. Fruit Grow. I. V. Michurin) 1935 : No. **5** : p. 93.
One of Michurin's new forms of *Actinidia* proved to be uncommonly rich in vitamin C in the fruits, amounting to as much as 9 grm. of antiscorbutic acid per kg. of fruit, and further studies are to be made on the utilization of this valuable fruit.

1396. Horne, W. T. 634.653 Fuerte
**Some California results with avocados which may be of interest in the Rio Grande Valley.**
Proc. 2nd Annu. Tex. Citrus Inst. 1933 : 73–81.
Dealing with the question of varieties it is mentioned that avocado growing in California was made possible by the discovery of the Fuerte variety, which has the cold resistance of typical Mexican forms but much more desirable fruits.

## SMALL BUSH FRUITS 634.7

1397. Slate, G. L. 634.7:575(74.7)
**Discussion on small fruits. The newer varieties of small fruits.**
Proc. 81st Annu. Mtg. N.Y. St. Hort. Soc. 1936 : 272–76.
Brief accounts are given of some of the new varieties of strawberries and red, purple and black raspberries bred by the United States Department of Agriculture, many of them at the New York State Experiment Station, Geneva.
Two new red raspberries are to be introduced by this station in the autumn of 1937 ; one, a sister of Taylor, is the largest red raspberry in existence and the other is an improved autumn-fruiting variety. The two main objects in raspberry breeding at present are the development of varieties that will not be troubled seriously by mosaic and the production of new autumn-fruiting varieties that will be good enough to raise for the summer crop.
In strawberries emphasis is being placed on the development of late varieties as well as very early sorts, shipping quality, dessert quality and attractiveness being important requirements.
Attention is also being devoted to blackberry breeding.

1398. Jones. L. K. and Baur, K. E. 634.711–2.8–1.521.6:575
**Mosaic and related diseases of raspberries in Washington.**
Bull. Wash. Agric. Exp. Sta. 1936 : No. 324 : Pp. 19.
Varietal differences in susceptibility and the effects of infection and rate of spread are noted. Lloyd George appears to be the most promising red raspberry but its fruit production and quality must undergo further tests.
Black raspberries are more susceptible to the mosaic, though certain varieties appear less so than others.

## STRAWBERRIES 634.75

1399. 634.75:575.127.2
FEDOROVA, N. JA. 634.75:575(47)
**(Interspecific and intraspecific hybridization in the strawberry and its significance in breeding).**
Bull. Appl. Bot. Leningrad 1935 : Ser. A (15) : 101–10.

In 1930 four hybrids of *Fragaria vesca* (2n = 14) and *F. elatior* (2n = 42) were obtained from 5,430 hybrid seeds sown. Two of these had the somatic chromosome number 28 and the other two 35, evidently having arisen from the union of an unreduced egg of *F. vesca* with a normal pollen grain. The pentaploids however shewed more resemblance to *F. elatior* than the tetraploids. Quadrivalents were observed at meiosis in the tetraploids, shewing the homology of the chromosomes of all four genoms, and the plants were quite sterile. There is a possibility therefore that they are autotetraploids arising from an unreduced egg cell which had given rise to the embryo and further doubled its chromosome number. In any case it is clear that *F. vesca* x *F. elatior* is not a promising combination for economic purposes.

Crosses were made in 1929 between *F. elatior* and *F. grandiflora* (2n=56) and forty-five hybrids were obtained, some of which were partially fertile. The hybrids were intermediate in both form and chromosome number, i.e. 2n = 49. Thirty-two $F_2$ plants were obtained by self-pollination and these all had different chromosome numbers, 42, 56, 63, 77, 84 and 98 being observed in different plants. The last is thus an amphidiploid. This plant was however the least vigorous in growth and the hybrids with 56 and 63 chromosomes were 5–6 times as big : the others were intermediate but all, with the exception of the amphidiploid, were more vigorous than the parental types.

Similar hybrids were obtained by back-crossing with *F. elatior* ; one of these hybrids had 91 chromosomes and another 56, and the latter was again 5–6 times the size of the former. It is pointed out that this mass appearance of polyploids is an unusual phenomenon and may lend particular interest to this *Fragaria* cross, some of the new polyploid forms being of possible practical interest.

On the whole however the more promising type of hybridization is between species of the same chromosome number or within the species in the 56 chromosome octoploid group, with the participation also of the two wild octoploid species from which most of the commercial varieties have been derived, namely ***F. virginiana*** and ***F. chiloensis***.

The inheritance of a number of characters was studied in a cross between *F. vesca* L. with red fruits and *F. vesca* L. var. *semperflorens* with white fruit : the $F_1$ was intermediate in fruit colour and the $F_2$ segregated into 237 red to 70 white, i.e. a good 3 : 1 ratio. The ever-bearing character proved recessive, there being 202 normal : 73 ever-bearing in the $F_2$ : there is the possibility that modifying genes for this character are also present. The higher number of flowering peduncles of the variety *semperflorens* was also recessive, the actual number being determined by multiple genes, as shewn by the $F_2$ ratios.

Crosses were made between male and female races of *F. elatior* and segregation occurred in $F_1$, giving 39♀ : 45♂ : 8 non-flowering. The same male race was used to pollinate a female race of *F. grandiflora* and gave in $F_1$ 18♀ : 26☿ or ♂ : 11 non-flowering. The hybrid sterility made classification difficult but some hermaphrodite plants which set seed on self-pollination did occur. The same male *F. elatior* race was again used to pollinate a hermaphrodite race of the same species. The $F_1$ consisted exclusively of male plants.

A female race of *F. elatior* was crossed with a hermaphrodite race and gave in $F_1$ 14♀ 16♂. In a similar cross between a female and a hermaphrodite *F. grandiflora*, the $F_1$ consisted of 30♀ 28♂. The same hermaphrodite race was used to pollinate a female *F. virginiana* and gave in $F_1$ 14♀ : 13☿.

From these results it is concluded that those female races which in crosses with hermaphrodite give female and hermaphrodite contain a normal female plus a weak male determinant and when a full male determinant is present not hermaphrodites, but males, are produced. The weak male determinant occurs most frequently in cultivated races. In breeding for hermaphrodite forms therefore it is necessary to pay particular attention to the type of female parent used.

## VITICULTURE 634.8

1400. KONDAREFF, M. 634.835:581.162.51
**(On varieties of vines with defective constitution of the flowers).**
Annu. Univ. Sofia V. Fac. Agron. Sylvicult. 1933/34 : **12** : 589–615.
Inflorescences of varieties with so-called female flowers, having short, recurved stamens, set only a very few bunches when isolated under parchment bags. If the flowers were emasculated before isolation no grapes were produced at all. Thus these varieties produce a certain amount of functional pollen, but to produce well-filled bunches they need pollinating with an active foreign pollen. The activity of the pollen of the varieties studied was not affected by treatments such as incision or clipping of the flowering branches. One variety, Sinia bodliva, had completely sterile pollen.
The variety Pamid coulard has completely fertile pollen, but shews great sterility in the ovules. It can, however, set a few grapes, shewing that its flowers are not strictly male.

1401. HARMON, F. N. and SNYDER, E. 634.873.4:581.163:575.247
**A seeded mutation of the Panariti grape.**
J. Hered. 1936 : **27** : 77–78.
A brief description of a somatic mutation occurring in the Panariti (Corinthe Noir) grape in Californian vineyards. The grapes on the mutant shoots are larger and contain viable seeds.
Since the Panariti grape is important commercially only as a producer of currant type, or seedless, raisins the mutation is decidedly detrimental, though it may be of use for breeding purposes.

1402. HARMON, F. N. and SNYDER, E. 634.873.4:581.163:575.247
**Grape mutation indicates selection need.**
Pacific Rural Press, 1935 : **130** : p. 558.
See Abst. 1401 above.

## FORESTRY 634.9

1403. 634.97:575(73)
632.42:576.16:634.97
**Fourteenth Annual Report and Program Appalachian Forest Experiment Station, Asheville, N.C.**
Summary of activities for the fiscal year ending June 30, 1935. 1934/35 : Pp. 30. (Mimeographed).
In connexion with the selection of seed trees in loblolly pine, samples of seed collected from 200 carefully described trees, have been subjected to cutting and germination tests and planted in the nursery for further study. Nursery stock will be planted in the field and studied.
About 2,500 cross-inoculations have been made in a study to determine whether one or more strains or species of *Nectria* are involved in the *Nectria* cankers of different hardwood species. It has been found that there are at least two strains or species, one in particular occurring only on yellow poplar and mountain magnolia.
On the Toccoa Forest an experimental planting of 10 *Populus* hybrids has been made, using 50 cuttings of each.

1404. 634.972:576.356.5
NILSSON-EHLE, H. 634.972–2.472.3–1.521.6
Über eine in der Natur gefundene Gigasform von *Populus tremula*. **(On a gigas form of *P. tremula* found in nature).**
Hereditas, Lund 1936 : **21** : 379–82.
A clone of male aspens growing at Lillö, South Sweden attracted attention by the markedly larger and darker leaves of the trees, which on closer examination were found to exhibit the typical characteristics of a gigas form as compared with the normal aspens in the vicinity. An autopolyploid origin is suggested for the mother plant from which the clone is derived, an hypothesis which is confirmed by the cytological findings (see Abst. 1405.)

The gigas form grows more quickly, produces more wood per year and is more resistant to attack by *Polyporus* than the normal aspen. Its stronger growth allows it to succeed well in competition with lime, maple, elm and so on whereas the normal aspen only grows to a limited extent on the edge of stands of broad-leaved trees.
It is tentatively suggested that the heat from forest fires may cause an increase of this kind in chromosome number.

1405. MÜNTZING, A. 634.972:576.356.5:575
**The chromosomes of a giant *Populus tremula*.**
Hereditas, Lund 1936 : **21** : 383–93.
The gigas form of aspen described elsewhere (see Abst. 1404.) was found to have about 57 somatic chromosomes as compared with 38 in normal diploid individuals and is therefore triploid.
Meiosis was very irregular, trivalents, bivalents and univalents being observed at metaphase I. The frequent occurrence of trivalents and the presence in triplicate of a very large and easily distinguished chromosome indicate that this is a case of autopolyploidy.
The pollen grains were irregular as a result of abnormalities of meiosis. In general they were bigger than those of diploid forms. The frequency distribution of pollen grain diameters was bimodal, one mode presumably corresponding to the reduced chromosome number and the other to the unreduced. It is possible that the latter may function in crosses with diploid forms to give tetraploids, possibly of economic importance.
The fact that the triploid clone is purely male is of interest in view of the fact that sex chromosomes have been reported in this species.

1406. MEURMAN, O. 634.972.2:576.356.5
**Some additional remarks to the question of polyploid *Acer platanoides* biotypes.**
Memor. Soc. Fauna Flor. Fenn. 1934 : **10** : 74–76.
In 22 seedlings previously examined one was triploid (Cf. " Plant Breeding Abstracts," Vol. IV, Abst. 266), suggesting that diploid gametes are not uncommon in *A. platanoides*. A further search however, involving 100 seedlings, has failed to bring to light another instance of triploidy. The author appeals to botanists to take note of any sterile and vigorous individuals in this species in the hope that other polyploids may be discovered.
The fact that no diploid gamete formation has been observed in studies of the pollen mother cells of *A. platanoides* suggests that the diploid gamete participating in the production of the triploid seedling was produced as a result of somatic duplication in the track of the germ cells, somatic duplication of the chromosomes being a common phenomenon in this species (Cf. " Plant Breeding Abstracts," loc. cit.).

1407. PELLETIER, M. 634.972.4:576.312.35
Recherches cytologiques sur l'*Aesculus hippocastanum* L. (**Cytological researches on *Ae. hippocastanum* L.**).
Botaniste 1935 : **27** : 279–322.
A description is given of the seed and its germination, followed by an account of the fixation of the root tips, of the nuclei and of the various phases of its somatic division, particular attention being given to the behaviour of the nucleoli, of which there are two in every cell.
The somatic chromosome number 38 was determined.

1408. MORRISON, B. Y. 634.973 *Robinia pseudoacacia* var. *rectissima*
**A new variety of black locust.**
Science 1935 : **82** : 326–27.
This new form is to be named *Robinia pseudoacacia* var. *rectissima*. It differs in bark, stem, and flower characters, and in the exceptional durability of its wood when in contact with the soil. It is also of remarkably straight habit.

1409. 634.975:575.42:575.11(43)
BEHRNDT, G. 634.975–2.42–1.521.6
Die bisherigen Ergebnisse der Individualauslese bei der Kiefer I. (**The results obtained up to the present time in individual selection in the pine tree**).
Mitt. Forstwirt. Forstwiss. 1935 : **6** : 402–17.

A brief note on the history of the breeding of forest trees in Germany and on possible methods in the future precedes the statement of the results obtained by individual selection in three plantations consisting of the progenies from single trees and seedlings obtained from certified seed.
For the 7-year observation period all three plantations demonstrated differences in the height attained by the various progenies of the same age from single trees.
These differences are regarded as being partly due to genetic causes and partly to differences in susceptibility to *Lophodermium pinastri*, one progeny No. 16 in one of the three plantations exhibiting remarkable resistance to this fungus throughout, as well as particularly high growth averages. Data from another plantation suggest that in this case the differences are very likely genetic in nature and the possibility that polymeric factors may be operating is considered at some length with incidental observations on the bearing of pollination on the problem.
In a number of four- and six-year-old trees examined a very clear positive correlation between height and diameter of the trunk was also recorded, the size of the correlation being dependent to a great extent on environmental conditions though the reaction of the various progenies to unfavourable conditions appeared to differ. The wind resistance and type of branch formation could not be investigated at the present stage.
In future breeding work with the pine and other long lived species hybridization and other complicated processes are not practicable. The most important problem awaiting investigation is the study of pollination within forest stands.
A useful bibliography of standard papers on the subject is appended.

1410. FLOUS, F. 634.975:581.9:582(7)
Diagnoses d'espèces et variétés nouvelles de *Pseudotsuga* américains. (**Diagnosis of new species and varieties of American forms of *Pseudotsuga***).
Trav. Lab. For. Toulouse 1934 : Tome I : Vol. II : Article VI : Pp. 18.

In addition to the accepted North American species of *Pseudotsuga, P. Douglasii, P. glauca* and *P. macrocarpia*, the authoress claims to have identified from herbarium specimens the following 6 additional species and 2 new varieties, some of which are found outside the United States : *P. Vancouverensis, P. californica, P. Merrilli, P. Rehderi, P. globulosa. P. Flahaulti*, and the two varieties of *P. Guinieri*, var *mediostrobus* and var. *parvitrobus*, which differ in the size of the cones. With a key for the identification of the species discussed there is also a map of North America illustrating the distribution of the species of *Pseudotsuga*.

1411. GLEASON, H. A. and PANSHIN, A. J. 634.976.22 *Swietenia Krukovii* (81)
*Swietenia Krukovii* : **a new species of mahogany from Brazil.**
Amer. J. Bot. 1936 : **23** : 21–26.

After a brief summary of the species of *Swietenia* already known the botanical description of the new species identified from herbarium material collected at Porto do Brasil on the River Jurupany is given. The characters of the leaf and fruit are noted, with a description of the tree, which is commonly known as Aguano, and the range, habitat and occurrence are indicated as far as existing information permits.

1412. MEDVEDEV, P. 634.976.26
(**Sesban introduction results**).
Soviet Subtropics 1936 : No. 1 (17) : 32–42.

Descriptions are given of a large number of species of *Sesbania* introduced from different countries for use as fibre, fodder or green manuring plants.

1413. COULTER, R. H. 635:575

**The development of improved strains of vegetables.**

Proc. 21st Annu. Mtg. Ohio Veg. Gr. Ass. 1936 : 41–48.

An account of some of the achievements of the Ferry-Morse Seed Company in breeding new varieties of peppers, cucumbers, celery, carrots, onions and radishes. It is pointed out that in the end the customers dictate the aims in breeding.

1414. 635:575(73)
633.15:575(73)

**The season's new vegetable varieties. Results of the All-America competition of last year are found in this season's catalogues.**

Horticulture 1936 : March 5th : p. 118.

Notes on new radishes, parsley, peas, maize, tomatoes, etc. raised in U.S.A.

1415. SOMERS, L. A. 635:575(73)

**New and improved varieties of vegetables.**

Trans. Ill. Hort. Soc. 1935 : **69** : 317–27.

A comprehensive review of breeding work on vegetables in the U.S.A.

In sweet corn breeding has been directed along three different lines, extreme earliness, resistance to Stewart's disease and improvement in yield and quality for canning, and several varieties or crosses have been produced to meet these requirements.

The trend in snap beans (*Phaseolus vulgaris*) has been towards stringless varieties with thicker, round and oval pods. Mosaic-resistant varieties have also been produced.

The main problem in tomatoes has been the production of varieties resistant to *Fusarium* wilt and several have now been produced, notably those developed by F. J. Pritchard.

Resistance to Fusarium wilt has also been the chief aim of pea breeding.

In cabbages the need for resistance to cabbage yellows has led to the production of several disease-resistant varieties for different purposes.

The newer varieties of muskmelon are smaller, sweeter, more luscious, heavier meated, heavily netted and more suitable for transport. In California the appearance of a serious mildew disease has led to the production of disease-resistant forms.

Quality has been the main problem with respect to carrot breeding, efforts having been directed to the production of a smaller, more tender and less conspicuous core.

In spinach the problem has been to produce varieties that do not run to seed quickly and also, particularly in Virginia, blight-resistant varieties.

Most of the breeding work with rhubarb has been done in Canadian universities, the tendency being towards smaller stems and a deeper and consistently red colour.

Thicker walled and smoother varieties of the mango type have been the aim of breeding work in peppers.

Quality and resistance to onion thrips have been bred for in onions.

Most of the breeding in potatoes has been directed towards the production of mosaic-resistant, white, shallow-eyed, high yielding, late potatoes, Katahdin and Chippewa being the outstanding new varieties.

1416. HAWTHORN, L. R. 635.00.14

**Vegetable varieties for the Winter Garden region of Texas.**

Bull. Tex. Agric. Exp. Sta. 1935 : No. 508 : Pp. 139.

Having indicated the significance of stocks, strains and varieties and the basis of the estimation of cold resistance, the results of an extensive series of variety trials of a large number of vegetables of different kinds are recorded, with descriptions of the varieties. A list of specially recommended varieties is appended.

1417. Brown, H. D., Romske, F. and Riley, O. N. 635.00.14(77.1)
**Vegetable variety tests—1935.**
Proc. 21st Annu. Mtg. Ohio Veg. Gr. Ass. 1936 : 54–60.
The results of tests of cabbage, tomato, lettuce, pea and cauliflower varieties are given ; the tests were carried out at Marietta and Columbus in 1935.

1418. Levan, A. 635.25:575.127.2:576.354.4:576.312.34
Die Zytologie von *Allium cepa* x *fistulosum*. (**The cytology of *Allium cepa* x *fistulosum*).**
Hereditas, Lund 1936 : **21** : 195–214.
The somatic chromosomes of each species consist of 14 with median or sub-median constrictions and 2 with sub-terminal constrictions and satellites. The chromosomes of *A. cepa* are bigger than those of *A. fistulosum* and the satellited chromosomes are clearly different in the two species, the satellite being much larger and the short arm relatively shorter in *A. fistulosum*. The somatic complement of the hybrid was the sum of the two parental gametic complements, the two different satellited chromosomes being easily identified. The difference in width of the parental chromosomes disappeared in the hybrid, in which the chromosomes were of uniform width.
At meiosis *A. fistulosum* shews localized chiasmata while random chiasma formation is found in *A. cepa* ; in the hybrid, as previously reported, (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 286) chiasma formation was random. Apart from this meiosis in the hybrid was characterized by numerous and striking irregularities, attributed to structural differences between the parental complements, e.g. the formation of univalents, multivalents and asymmetrical bivalents ; in one case a chromosome was observed to have formed a chiasma with another part of itself, giving rise to a small ring. The chiasma frequency at metaphase I was about half that of *A. cepa*, the comparable parent, and the terminalization coefficient was also much reduced. Anaphase I was correspondingly irregular, the segregation of the bivalents being often accompanied by the formation of chromatin bridges, in some cases of the type resulting from chiasma formation within a segment inverted in one chromosome and not the other. Micronuclei were present at interkinensis and irregularities were also found in the second division.
The results of these irregularities were studied in the first pollen grain division. The pollen grains ranged in size from minute microcytes to giant grains. The chromosome numbers ranged from 4 to 11 in the ordinary grains and from 16 to 19 in the giant grains, a surprising feature being the ability of grains without a complete complement to survive, which is unusual in *Allium*. Certain of the giant complements clearly arose from a monokinetic meiosis. Morphological as well as numerical abnormalities were observed and many new types of chromosomes were to be seen in the pollen grain divisions. In general the divisions resembled those produced by X-ray irradiation at meiosis.
The origin of the new types of chromosome is discussed and it is pointed out that they represent secondary changes, being produced as a result of crossing-over in the asymmetrical and irregular configurations produced at meiosis.
The irregularities found in the present material are greater than those previously reported (Cf. " Plant Breeding Abstracts," loc. cit.)and this is ascribed to a wider divergence between the parent forms used in the present work. In both cases chiasmata were to be observed with all four arms of different lengths, shewing that they had arisen as a result of crossing-over.

1419. Titard, A. 635.31–1.557:577.81
Les caractères sexuels secondaires de l'asperge. De l'intérêt qu'il y aurait à ne cultiver que les pieds mâles (**Secondary sexual characters of asparagus. The advantage of cultivating only male plants**).
Sélectionneur 1935 : **4** : Fasc. 3–4 : 24–29.
Observations in 1934 and 1935 with different varieties of asparagus confirmed the view already held by various investigators that the male plants are earlier and heavier yielders than the female plants.
A way of separating the sexes at an early stage by sowing in February was tried and appears to offer a basis from which a practical method might be worked out for commercial purposes.

1420. BREMER, H. 635.31–2.452–1.521.6:575
Zur Epidemiologie und Bekämpfung des Spargelrostes. (**The epidemiology and control of asparagus rust**).
Gartenbauwiss. 1936 : **10** : 51-73.
The epidemiology of *Puccinia asparagi* is described in some detail. Reference is made to the success achieved in the United States of America with the cultivaion of rust resistant varieties, notably Mary Washington. Tests made by the author have shewn that these Washington varieties, although they are in Germany by no means free from rust attack, are nevertheless attacked much later and less violently than the German varieties. The experimental data leading to this conclusion in 1934 and 1935 are presented in tabular form. One promising line of breeding for resistance is thus suggested, namely selection from the Washington lines. The detection of clear differences in attack between individual plants shews the lines to be genetically impure and to offer a promising basis for further selection, followed by crossing with the best German varieties to produce lines commercially suitable for local cultivation. Another method proposed for the immediate production of resistant lines is mass selection in the progeny of natural hybrids between the Washington and the German varieties. In this way about 100 rust-free plants were selected in 1935.
In spite of the lack of genetically pure starting material and the possible existence of physiological forms of the fungus, the author is confident that some progress at least is possible in breeding rust-resistant asparagus and urges that an immediate start be made with the work.

1421. BLANK, L. M. 635.34–2.484–1.521.6:575.11
**Two types of yellows resistance in Wisconsin All Seasons cabbage.**
Phytopathology 1936 : **26** : p. 87. (Abst.)
The two types of resistance to *Fusarium conglutinans* are described (Cf. " Plant Breeding Abstracts," Vol. VI, Absts. 661 and 662).

1422. 635.52:575.11
ERNST–SCHWARZENBACH, M. 635.52:581.143.26.035.1
Fertilität, Photoperiodismus und Genetik von *Lactuca sativa* L. (**Fertility, photoperiodism and genetics of *L. sativa* L.**)
Züchter 1936 : **8** : 11–21.
Lettuce plants are normally perfectly self-fertile and out of 149 cross-pollinations between different varieties only 15 failed to set seed ; further cross-pollination experiments with 379 varieties gave seed in all but 49 cases, i.e. only 12·9 per cent failed. Successful pollinations have also been made between *L. sativa* and the wild *L. Scariola*, but attempts to cross either of these species with *L. virosa* resulted only in failure.
Head formation in the lettuce is conditioned by the failure of the inflorescence to develop, i.e.by a failure of the plant to pass to the reproductive phase, and this has been shewn by Bremer (" Plant Breeding Abstracts," Vol. II, Abst. 154) and others to be governed by the length of day, except in the case of summer varieties, which are neutral photoperiodically. Bremer and Gana (" Plant Breeding Abstracts," Vol. VI, Abst. 291) have moreover shewn this difference in reaction to be hereditary, determined by a single gene *T* for short-day reaction. The results of these authors are summarized.
In 1932 the authoress made a number of crosses between plants free from anthocyanin and plants shewing varying degrees of pigmentation. In this way 1,180 hybrid plants were obtained. When grown in the open, or in low temperature chambers at 1–6°C. the plants formed no pigment at all, and pigment was only formed in the open after an unusually cold night. The type of pigmentation moreover altered during the growth of the plants, so that certain hybrids at one period resembled the one parent and at a later period the other parent ; reciprocal hybrids also behaved differently in these respects. The final results from the cross of Wunder der vier Jahreszeiten (strongly pigmented) with the green variety Gelber krauser Schnittsalat were 174 red : 149 green plants, which closely corresponds to a 9 : 7 ratio. The latter variety when crossed with another red variety Blutroter Kochsalat gave 98 pigmented : 96 green, which deviates somewhat more

from the 9 : 7 ratio (by 5·7 per cent). The variety Blutroter Kochsalat was also crossed with an unpigmented form of *L. Scariola* and gave an $F_2$ consisting of 141 pigmented and 39 green individuals, i.e. in this case a ratio of 3 : 1. It seems therefore that anthocyanin formation is conditioned differently in different varieties and much further study is necessary to provide a full solution of the problem of its inheritance.

The results of Durst (" Plant Breeding Abstracts," Vol. I, Abst. 428) and other authors on other colour and morphological factors in lettuce are reviewed. Some of these results were confirmed by the author's own experiments. For instance crosses were made between forms of *L. Scariola* with entire and segmented leaves, whereby the segmented form was shewn to be dominant in $F_1$, the $F_2$ giving a segregation of 381 entire : 120 segmented individuals. Crosses of the segmented form of *L. Scariola* with the entire varieties of *L. sativa* Hochheimer Danerkopf and Blutroter Kopfsalat gave a bifactorial segregation in $F_2$, with 49 segmented and 39 entire. Other crosses of the same segmented *L. Scariola* with the varieties Stuttgarter, Dannhäuser and Transport Kopfsaltat gave a total of 438 segmented and 202 entire individuals in $F_2$, which conforms slightly better with a monofactorial than a bifactorial ratio. Again, Gelber krauser Schnittsalat (segmented) was crossed with the segmented *L. Scariola* and gave only segmented progeny. When the entire form of *L. Scariola* was used the $F_2$ segregated into 110 : 34, i.e. a good 3 : 1 ratio. Still further studies would be necessary to give a full explanation of the inheritance of these leaf forms; it is possible that environmental factors influence the expression of the character also.

Observations on the available material of *L. Scariola* have shewn that this consists of a large number of forms, differing rather markedly one from the other, most of which are genetically pure. They may have arisen as the result of a large number of gene mutations. Mutations have been observed by the present and other authors also in *L. sativa*, shewing that *Lactuca* is in general rather prone to mutation. The existing varieties of cultivated lettuce may have arisen therefore by mutation from the wild *L. Scariola*, or alternatively from natural hybrids between *L. Scariola* and other wild species. It is significant that all the typical characters distinguishing the cultivated from the wild species are recessive.

A table is given of the genes whose hereditary behaviour is so far known.

1423. 635.52:576.312.35

COOPER, D. C. and MAHONEY, K. L. 633.854.78:576.312.35

**Cytological observations on certain compositae.**

Amer. J. Bot. 1935 : **22** : 843–48.

Among the species examined for their chromosome number were *Lactuca scariola* L. and *Helianthus grosseserratus* Marteus, and the pollen-mother-cells shewed the haploid numbers to be 16 and 9 respectively. In the latter species a ring of 4 chromosomes and 7 bivalent pairs were observed at diakinesis and on the heterotypic equatorial plate. Other records of a compound bivalent formed by the association of 2 pairs of chromosomes in *Lactuca* are mentioned.

1424. HOFFMAN, I. C. 635.52 Strain No.7:632.19–1.521.6:575.42

**Breeding tip-burn resistant lettuce.**

Proc. 21st Annu. Mtg. Ohio Veg. Gr. Ass. 1936 : 96–98.

The selection of strain No. 7 from the Grand Rapids lettuce is described. The strain is resistant to tip-burn and has been found to be very satisfactory from a commercial point of view.

1425. 635.54:581.143.26:575

CHMELAŘ, F. and ŠIMON, J. 635.54.00.14(43.72)

Výsledky pokusů s novými odrůdami čekanky na Moravě v letech 1933–35. (**Results of experiments with new varieties of chickory in Moravia in 1933-35.**)

Ann. Acad. Tchécosl. Agric. 1936 : **11** : 21–26.

Trials were made of three foreign varieties and one Chechoslovakian. The latter with Vilmorin's improved variety did specially well as judged by the yield of dry matter. Bolting was marked except in Vilmorin's variety.

Future breeding work should be directed towards obtaining forms resistant to bolting and with a suitable shape of root.

1426. LESAGE, P. 635.563:575.31"793"
**Sur la précocité acquise et héritée à Rennes et à Alger, en 1935. (On acquired and inherited earliness at Rennes and at Algiers).**
C.R. Acad. Sci. Paris **1935** : **201** : 791–92.
A brief note on the progress of the author's experiments with *Lepidium sativum*. Seed from plants cultivated at Algiers for some generations, when sown at Rennes, gave plants exhibiting acquired and hereditary earliness. (Cf. " Plant Breeding Abstracts," Vol. VI, Abst. 1030).

1427. MCKAY, J. W. 635.615:581.48:575.11.061.6
**Factor interaction in Citrullus. Seed-coat color, fruit shape and markings show evidence of mendelian inheritance in watermelon crosses.**
J. Hered. 1936 : **27** : 110–12.
In a cross between forms of *Citrullus vulgaris* Schrad. with tan and red seed coats respectively, red behaved as a simple recessive, which it also did in a cross with a green-seeded form. It is therefore suggested that tan is produced by a single dominant factor *T*, green by a single dominant factor *G*, while red is the double recessive. The colour of the double dominant is not yet known.
Other character pairs which are mentioned as apparently depending on single factors are oblong versus round fruit shape and green stripe versus white stripe fruit markings.

1428. 635.615–2.483–1.521.6:575.11
LAYTON, D. V. 635.615–2.484–1.521.6:575
**Anthracnose-resistant watermelons.**
Phytopathology 1936 : **26** : **p. 99.** (Abst.)
Resistance to anthracnose (*Colletotrichum lagenarium*), found in a watermelon strain from Umtali, Southern Rhodesia, was found to behave as a simple dominant factor in crosses with susceptible varieties.
From further crosses with varieties resistant to *Fusarium* wilt, selections have been isolated which are homozygous for resistance to both anthracnose and wilt.

1429. 635.64 Glovel
PORTE, W. S., WOLFE, H. S. and FIFIELD, W. M. 635.64:575.12
**The Glovel tomato.**
Circ. U.S. Dep. Agric. 1936 : No. 388 : Pp. 6.
The Glovel tomato which has been derived from a cross between Globe and Marvel is globular in shape and a rich scarlet-red (pink) when ripe ; its fruits are of medium size with thick outer and inner walls, making for firmness ; and the fruit appears well adapted for shipping. Under the test conditions the fruits have been very free from growth cracks. The new variety is about a week earlier than Marglobe, usually maturing most of its crop within a shorter harvest period, though under good cultural conditions in the North it will bear until killed by frost.
Seed for trial and multiplication is being distributed to seed growers and firms.

1430. 635.64:575.125
DASKALOFF, C. 635.64–1.524(49.7)
**(Investigations on heterosis in tomatoes and the possibility of making practical use of it).**
Veröff. St. Versuchsst. Plovdiv 1935.
Indigenous Bulgarian varieties were crossed with foreign standard varieties and the $F_1$ yield was about 25 per cent higher than that of the particular parent varieties. Several $F_1$ progenies also gave highly favourable results in respect of earliness, size of fruit, resistance to bursting, the presence of relatively few seeds, etc., the Sarja x Komet cross being particularly good.
As the production of sufficient seed material is regarded as quite practicable economically, there should be nothing to prevent a wider distribution of the " heterosis " varieties in Bulgaria.

1431. Butler, L. 635.64:581.46:575.116.1
**Inherited characters in the tomato. II. Jointless pedicel.**
J. Hered. 1936 : **27** : 25–26.
In the French variety, Rouge naine hative, the pedicels of the flowers and fruits are curved instead of geniculate and lack the abscission joint characteristic of other varieties, with the result that when the fruits are picked the calyx remains attached to the plant instead of to the fruit.
This character was found to be determined by a single recessive gene *j* closely linked to leafy-inflorescence on the fifth chromosome.

1432. Alexander, L. J. 635.64–2.484–1.521.6:575
**Progress in the development of a new tomato variety resistant to leaf mold.**
Phytopathology 1936 : **26** : p. 86. (Abst.)
The results from $F_2$ and $F_3$ of crosses between small-fruited, homozygous resistant forms and the large-fruited, homozygous susceptible variety Globe indicate that resistance to leaf mould is determined by a single dominant factor ; this hypothesis is confirmed by the back-cross of the heterozygote to the recessive parents.
To obtain satisfactory fruit size in the progeny of such crosses it has been necessary to carry out a long programme of back-crossing and selection. Promising selections from the point of view of yield and quality have been obtained but they are not yet homozygous for resistance.

1433. Guba, E. F. 635.64–2.484–1.521.6:575
**Resistance to *Cladosporium fulvum*.**
Phytopathology 1936 : **26** : 382–86.
A summary is given in tabular form of the results of different workers on the reaction of commercial varieties of tomato leaf mould, *Cladosporium fulvum*. Though several varieties shew a fair degree of resistance, efforts to use this in breeding work have not been successful and workers in this field are turning to hybridization with the red-currant tomato, *Lycopersicum pimpinellifolium*, whose immunity has been found to be controlled by a single dominant factor. The work is proceeding in different parts of the world and appears likely to meet with success.

1434. Ivanov, N. N. 635.65:581.192:575
**(Leguminous plants as material for chemical breeding).**
Bull. Appl. Bot. Leningrad 1935 : Ser. A (15) : 53–60.
Being independent of soil nitrogen, many of the leguminous plants shew a much greater constancy in their chemical composition than do other plants, such as the cereals, whose nitrogen content is much more influenced by growth conditions. Thus pea seeds were found to vary hardly at all in content of salts, oil, protein and cellulose in samples grown at widely different places and under different conditions. The differences between varieties, on the other hand, are very pronounced. Thus the average protein content of all the peas tested amounted to 27·75 per cent, while Heines Viktoria gave 20·5—21·4 per cent and American Wonder 34·92 and over. There are therefore great possibilities of selecting varieties with higher protein content. For this purpose a micrometric method has been devised for the determination of the protein content of a single seed. Great variations have been found between different seeds of certain lines, e.g. in the variety American Wonder from 33·4 to 46·0 per cent. Similarly in lentils, *Ervum Lens* var. *nigra* contained 31.52 per cent protein and *E. Lens* var. *Laria* A1. 29.59 per cent. *Vicia sativa* and *V. Faba* were also found to be among the legumes which varied little with the conditions of growth, though not quite so constant as the earlier mentioned. The C/N ratio in this type was found to be also as constant as the protein content.
The lupin represents another type of legume : here wide variation in protein content occurs dependent upon the conditions of growth, but clear varietal differences are also present both

in protein content and in oil and alkaloid content and the lupin is also therefore a promising object for selection in all these directions. Similar variation is found in soya beans, in respect of protein and oil content, iodine number of the oil, and peroxidase content ; high oil and high protein containing lines of soya bean can therefore be selected. *Cicer arietinum* however proved as variable in composition as the common cereals dependent on growth conditions. This is probably connected with the fact that in the Soviet Union this plant forms no root nodules.

1435. 635.652:581.46:575.11.061.6
LAMPRECHT, H. 635.652:575.113.3
Zur Genetik von *Phaseolus vulgaris*. XII. Über die Vererbung der Blüten- und Stammfarbe. (**On the genetics of *P. vulgaris*. XII. On the inheritance of flower and stem colour**).
Hereditas, Lund 1936 : **21** : 129–66.

A detailed survey of the literature on the inheritance of flower colour in *Phaseolus vulgaris* is given.

The three main flower colours with which the author worked are termed " bishop's violet,"*, white and laelia-coloured.* The production of flower colour is only possible in the presence of the basic factor *P* for seed coat colour and the factor *T* for whole-coloured seed coat ; in *pp* or *tt* individuals the flowers are white. In the presence of *P* and *T* the seed coat colour factor *V* produces " bishop's violet " flowers, *v* producing white. " Bishop's violet " behaves as a simple dominant over laelia-coloured and the latter behaves as a simple dominant over white. It is concluded therefore that there is a series of multiple allelomorphs for flower colour, *V* producing " bishop's violet," $v_{lae}$ producing laelia-coloured and *v* producing white flowers. The middle member, $v_{lae}$ has no effect on seed coat colour, while in respect of flower colour it appears that both *V* and $v_{lae}$ are not completely dominant. The factors also influence the anthocyanin coloration of the stems, *V* producing red and $v_{lae}$ rose-coloured stems ; other genes, however, also appear to influence stem colour.

Another type of flower colour studied was described as terminal intensification. In coloured flowers this takes the form of an intensification of the colour on the upper margin of the standard, while in white flowers a margin of flesh-pink is produced. In most crosses this character behaved as a simple dominant and the factor is given the symbol *Aeq*. One case of dihybrid segregation (9 : 7) was observed indicating the presence of another factor for this character.

Symbols are also given to two factors described by earlier workers ; the factor described by Shaw, converting " bishop's violet " to crimson or laelia-coloured to waxy pink and producing a waxy coating on the leaves and stem, is designated *Nud*. The factor producing flecked petals (Cf. " Plant Breeding Abstracts," Vol. I, Abst. 439) is designated *lin*, the dominant, self-coloured petals being *Lin*.

1436 HARTER, L. L. 635.652–2.452–1.521.6:575.42(73)
**Two new rust-resistant white-seeded Kentucky Wonder beans.**
Seed World 1936 : **39** : 12–13.

The commercial strains of white and brown-seeded Kentucky Wonder beans grown along the Pacific Coast and in some of the eastern United States are subject to severe damage by rust. The two new varieties U.S. No. 3 and U.S. No. 4 have been developed from imported European forms by selection for rust resistance and quality carried on in Washington D.C. and in California. Both varieties are resistant to the more prevalent of the two known forms of rust on beans but somewhat less resistant to the other. U.S. No. 3 is a pale bean, stringless in all stages of growth, with round pods 6½ to 7 inches long, reaching the edible stage in 60 days and maturing seeds in 110 days. U.S. No. 4 is a pale bean, stringless in the marketable stage, stringy when older, with flat straight pods 7 to 8 inches long, reaching the edible stage in about 64 days and maturing seed in 110 days. The seed is indistinguishable from U.S. No. 3.

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* The following equivalents in Ridgway's Color Standards and nomenclature are given by the author :— Bishop's violet = Light Rosolane Purple, XXVI, 69'b to Liseran Purple, XXVI, 67'b ; Laelia coloured = Light Pinkish Lilac to Pale Laelia Pink, XXXVII 65" f–g to XXXVIII, 67" f–g.

1437. RIEDE, W. 635.655:575(43)
Deutsche Sojazüchtung. (**Soya breeding in Germany**).
Mitt. Landw. 1935 : **50** : 804–05, 829–31.
The similarity between the climates of northern Manchuria, where wild soyas occur, and many parts of Germany is pointed out and experiments have shewn that many of these forms will grow successfully in Germany. The majority of varieties are very limited in their adaptability and it is desirable to produce forms with a wider range of adaptability. Among the large number of breeding aims enumerated resistance to disease (including virus), neutral photoperiodism, time of maturity and numerous factors influencing yield and quality are mentioned. Special forms will have to be produced for oil, fodder and culinary use, and the desirable characteristics of these are enumerated. The unusually large number of hereditary character differences is a very favourable factor in soya breeding and the number of such differences seems to be increasing since introduction into Germany. Various economically important characters for which the dominance relationships are known are mentioned; no difficult linkages have so far been observed. Negative correlations of a physiological nature have been observed between oil and protein content, though exceptions occur, but no correlations between clear morphological characters and quality factors, such as might serve as a guide in selection, have yet been detected.
The various methods of breeding are described. In cross-breeding both combination of desirable characters from different parents and the increase of a particular character by combining the factors present in different parts are envisaged. It is also hoped that new characters, some of them of possible interest for culinary purposes, may appear.
German breeders have carried out selections on soya material obtained from all over the world and by cultivation over a number of years the climatically most suitable types have been isolated. In this way lines capable of successful cultivation in most parts of Germany have been produced. Hybridization work is in progress and work on artificial mutations is planned. The author is confident that no less success is to be expected with the soya bean than was witnessed in earlier centuries with the introduction of the potato.

1438. JOHNSON, H. W. and HOLLOWELL, E. A. 635.655–2.6–1.521.6:575.11.061.5
**Pubescent and glabrous characters of soybeans as related to resistance to injury by the potato leaf hopper.**
J. Agric. Res. 1935 : **51** : 371–81.
The $F_3$, $F_4$ and $F_5$ progenies of a cross between a glabrous and a " rough-hairy " variety, glabrousness behaving as a simple dominant character, were studied in relation to infestation by potato leaf-hopper, *Empoasca fabae* (Harris). Without exception, it was found that glabrous plants suffered severely, their growth being stunted and their leaves curled, with yellowed margins. Rough-hairy individuals, on the other hand, were almost entirely free from *Empoasca*, grew vigorously and shewed no symptoms of attack.
Similar observations were made on introduced varieties of soya beans, glabrous varieties being stunted, and rough-hairy plants, whether from rough-hairy varieties or segegrated from a glabrous line, being unaffected, while a third type, described as "sparingly appressed-hairy," was only slightly affected.
When the glabrous plants of the hybrid progenies were protected from *Empoasca* attack they were almost as tall as the rough-hairy individuals, indicating that the extreme differences in vigour between the two types when grown in the field were due in part to infestation with *Empoasca* (Cf. " Plant Breeding Abstracts," Vol. I. Abst. 99). The evidence suggests very strongly that the freedom from attack of the rough-hairy plants is due to their pubescence.

1439. HÅKANSSON, A. 635.656:575.127.2:576.354.4:576.356.2
Die Reduktionsteilung in einigen Artbastarden von *Pisum*. (**The reduction division in some species hybrids of *Pisum***).
Hereditas, Lund 1936 : **21** : 215–22.
The reduction division in *P. humile* x *P. fulvum* was completely regular, with 7 bivalents and regular separation at anaphase I.

In the $F_1$ hybrids from one cross between *P. humile* and *P. arvense*, the plants being semi-sterile, a quadrivalent was present, the behaviour being similar to that in an ordinary semi-sterile individual.
In the $F_1$s of another cross between these species, $7_{II}$ or $5_{II} + 1_{IV}$ were found with about equal frequency while $1_{III} + 5_{II} + 1_I$ was an arrangement also observed. At anaphase I a chromatin bridge with an accompanying fragment was frequently observed, 6 cells out of 40 shewing it in one locule. The bridge and fragment were also to be seen at anaphase II and are ascribed to a relatively inverted segment in one of the forms used in this cross.

1440. Sasonkina, M. M. 635.656:575.127.5:633.367
**(Intergeneric hybridization of leguminous plants by the method of I. V. Michurin. Preliminary communication).**
Trudy Sel'skokhozjaistvennoi Akademii im. K. A. Timirjazeva (Proc. K. A. Timiriaseff Agric. Acad., Moscow) 1935 : **1** (2) : 141–56.
Experiments were made to test the applicability of Michurin's method of "vegetative *rapprochement*" (Cf. "Plant Breeding Abstracts," Vol. V, p. 376–77 and Abst. 1106) to herbaceous plants, the *Leguminoseae* being chosen for this purpose. The results of various attempts to graft lupin, pea, lentil, *Vicia* and *Phaseolus* in different combinations are described. In those cases where the graft was successful and seeds were formed the product was grafted again on to the species serving as rootstock, in which case the graft was more successful. This was so in the case of *Lupinus angustifolius* grafted on to peas *P. sativum* and *P. arvense*, and vice versa, from which large quantities of normally developed seeds were obtained. The fertility of the other combinations was much reduced and many of them did not flower at all; the flowers when present were often deformed.
From the grafts of *P. arvense* with *L. angustifolius* and *L. polyphyllus* hybrid seeds were obtained; in the first case from 462 grafted flowers pollinated 54 seeds were produced, whilst similar pollinations of ungrafted plants gave no seeds at all, and in the second case 1,000 pollinated flowers produced 58 seeds. Some of the fruits shewed abnormalities of development and the seeds are thought to be true hybrids.
From these crosses it is expected that improved forms of both plants, including alkaloid-free lupins and perennial peas, may be obtainable.

1441. Krajevoj, S. I. and Rassuly, R. A. 635.656:576.356.2
**On the frequency of translocations in different sections of the chromosome in *Pisum*.**
C.R. (Doklady) Acad. Sci. U.R.S.S. 1935 : **4** (IX) : 225–29.
Examinations of 1,610 nuclear plates of 133 seedlings subjected to X-rays shewed that the number of breaks in the chromosomes increased with the dose of X-rays. The frequency was noted with which breakage occurred at different distances from the spindle fibre attachment and it was found that a zone of maximum breakage exists at about $1\mu$ distant from the fibre attachment on each side and the frequency of breakage falls with increasing distance from the attachment. It is thought that the central regions are those subjected to the greatest strains when the chromosomes are pulled apart at meiosis and hence tend to break more easily at these points of maximum strain.

1442. Nilsson, E. 635.656:576.356.2:581.162.5
Erblichkeitsversuche mit *Pisum*. IX. Fortgesetzte Studien über semisterile Formen. (**Inheritance experiments with *Pisum*. IX. Further studies on semi-sterile forms**).
Hereditas, Lund. 1936 : **21** : 167–84.
As a preliminary to investigating the effect on linkage of the translocations causing semi-sterility, an effort has been made to distinguish by crossing experiments the two prime types, o-normal and x-normal of four cases of semisterility; the o-normal is homozygous normal and the x-normal homozygous translocated.
Line L.34 from the variety Extra Rapid gave semi-sterile $F_1$ progeny with eight other lines, all other combinations among these lines giving fertile $F_1$s. This shews that L.34 (and probably

the whole variety Extra Rapid) represents the x-normal type of the semi-sterility case N.IV, in whose origin it participated. The other cases N.I, II, and III, whose parent lines were concerned in these crosses, must have arisen spontaneously, as the lines concerned were shewn to be o-normal in each case.
The two prime types in each of the cases N.I and N.III were recovered and identified in further progeny of the original plants, while in N.II the two types have been recovered but are not yet identified.
The prime types now known in *Pisum* are reviewed.
An abnormal type, outwardly somewhat resembling *P. elatius*, obtained with some regularity from segregating N.IV plots is described. Its cytology is reported elsewhere (see Abst. 1443).
Discussing the taxonomic significance of the type of intersterility here considered which depends on the lethal nature of certain gene combinations, the author concludes that it cannot be used to delimit species. In the self-fertilized progeny of a semi-sterile hybrid the two parent types are recovered with increasing frequency in succeeding generations, the hybrid gradually disappearing, assuming no complications due to differential viability.

1443. HÅKANSSON, A. 635.656:576.356.4
Die Zytologie eines trisomischen *Pisum*-Typus. (**The cytology of a trisomic *Pisum* type**).
Hereditas, Lund 1936 : **21** : 223–26.
The origin of the type has been described elsewhere (see Abst. 1442).
Somatic plates shewed 15 chromosomes, indicating a trisomic condition. At the first metaphase of meiosis $6_{II} + 1_{III}$ and $7_{II} + 1_{I}$ were observed with about equal frequency, the trivalent being a chain of three or a rod and ring type. When a univalent was present it split at the first anaphase, otherwise seven chromosomes went to one pole and eight to the other.
The most probable mode of origin of the trisomic appears to be non-disjunction in the parent form, which has a ring of four chromosomes at meiosis. The combination of five chromosomes to be expected on this hypothesis was not observed, but this may be due to scarcity of material.

1444. WALKER, J. C. 635.656–2.484–1.521.6
**A study of resistance to *Fusarium* wilt in Alaska peas.**
Amer. J. Bot. 1935 : **22** : 849–57.
An attempt to explain the nature of resistance and susceptibility of strains of the Alaska garden pea (*Pisum sativum*) to *Fusarium orthoceras* A. and W. var. *pisi* Lin. The different effects of root extracts from susceptible and resistant strains upon the growth of the wilt organism suggest the presence of some inhibiting substance or substances in resistant strains.

1445. JOHNSON, F. and JONES, L. K. 635.656–2.8–1.521.6
**Virus diseases of peas.**
Phytopathology 1936 : **26** : p. 96. (Abst.)
Of 488 varieties and strains of peas tested for resistance to common mosaic and severe mosaic none were found to be immune, but 48 shewed some degree of resistance. The diseases also affect many other legumes.

1446. 635.659–2.484–1.521.6:575
635.659–2.6–1.521.6:575
KENDRICK, J. B. 635.659 Calva
**A cowpea resistant to *Fusarium* wilt and nematode root knot.**
Phytopathology 1936 : **26** : p. 98. (Abst.)
Californian blackeye cowpeas are susceptible to *Fusarium* wilt (*F. bulbigenum* var. *tracheiphilum*) and to root knot caused by *Heterodera marioni*, while Virginian blackeye cowpeas though resistant to wilt are not suited to Californian cultural practices.
By crossing the two types, selection and backcrossing to the Californian type, strains have been developed combining resistance to both *Fusarium* wilt and root knot with increased seed production, less vegetative vigour and commercially desirable seed types. The strains have been given the name " Calva " and are distinguished from one another by numbers.

1447. 635.67–2.3–1.521.6:575
IVANOFF, S. S. and RIKER, A. J. 633.15–2.3–1.521.6:575
**Genetic types of resistance to bacterial wilt of corn.**
Phytopathology 1936 : **26** : 95–96. (Abst.)
Studies on the resistance to bacterial wilt (*Phytomonas stewarti*) of inbred lines and $F_1$ hybrids of sweet corn, various commercial crosses and open-pollinated maize and sweet corn varieties have indicated the existence of three types of resistance, one correlated with vigour as measured by height, another correlated with lateness and a third, termed " true " resistance. In $F_1$ hybrids the last named type is determined mainly by the resistant parent, the susceptible parent having little or no influence.

1448. HIROE, I. 635.8:001.4(52)
(**List of edible mushrooms in Japan**).
Appl. Mushroom Sci. 1935 : **1** (1) : 24–29.
An alphabetical list of the Latin names of 137 species of edible mushrooms recognized in Japan.

1449. HIROE, I. 635.8.0015(52)
**Establishment of applied mushroom science in Japan.**
Appl. Mushroom Sci. 1935 : **1** (1) : 1–5.
This article describes a new journal which has recently been established to deal with morphological, physiological, ecological, and systematic research on mushrooms, and with their cultivation, methods of utilization, etc. According to the author there are over 140 species of edible mushrooms in Japan and many others are used in other ways. The necessity for supplying English summaries of the Japanese articles is considered.

# BOOK REVIEWS

MARBE, K. 519.2

Grundfragen der angewandten Wahrscheinlichkeitsrechnung und theoretischen Statistik. (**Basic problems in the application of the calculus of probabilities and of theoretical statistics**).

Verlag C. H. Beck, München and Berlin, 1934 : R.M. 8†. Pp. 177. 33 tables.

This publication is a theoretical investigation of the properties of " populations." It is well known that many results of the theory of probability are based on the assumption that the individual observations of a population are independent of one another. This independence, if restated in terms of the author's favourite example, would infer that the chance of scoring a red number with a roulette wheel does not depend on the previous scores with this wheel. The author, on the other hand, believes that generally there exists a certain correlation between the observations, for which he has introduced the term : " Statistical-Equalisation." In terms of another of the author's examples this correlation means that the chance for a child to be a boy is larger after a sequence of female births than after a sequence of male ones.

To " prove " his thesis (and to demonstrate his methods) the author tests a few examples, viz. Monte-Carlo gambling results, Munich-birth-records and Mendel's law in an experiment with peas, and others. One of these tests (to fix our ideas) consists in comparing runs of $n$ consecutive red roulette scores, viz. the number of $n$-runs actually observed with that expected for independent roulette scores.

Other tests of the author, however, have frequently been criticized. One as presented in the book, is based on an elementary misunderstanding : In Chapter 11 it is shewn that the ratio red scores : red scores plus black scores, if computed for the roulette-scores of $n$ consecutive days is correlated with that computed for the first $n$-1 of the former $n$ days. The author believes that the mere existence of this correlation disproves the independence of the roulette scores. H.O.H.

SAUNDERS, A. R. 519.24

**Statistical methods with special reference to field experiments.**

Sci. Bull. Dep. Agric. S. Afr. 1935 : No. 147 : Pp. 76. 43 tables. Price 6*d*.

The author describes in this bulletin the statistical methods required by the agricultural investigator. The language is simple, and great pains are taken to explain methods by means of worked out arithmetical examples. After introducing the simple statistical concepts, the author discusses tests of significance, and the various tables used in association therewith, which are reproduced, most of them from Fisher's " Statistical Methods for Research Workers." He then goes on to the analysis of variance technique as applied to field experiments, and covers the field here up to the analysis of covariance and the estimation of yields of missing plots. A concluding section is concerned with the more practical aspects of field plot technique, and there are 89 references.

There is little indeed to criticize, but the following points may be noted for use when the work is being revised. On page 10 the Sheppard correction should be described as one-twelfth of the *square* of the grouping interval. On page 13 it would be an advantage to give the more general formulae for two unequal samples, and to explain the reason for the different results reached by the two methods. On page 29 the number of degrees of freedom for $t$ should be 20, and not 10, being in fact the number of degrees of freedom in the error line of the analysis. In the composite analysis on page 45 it would seem more correct to test " varieties " against the interaction " varieties x years," when the differences would be seen to be insignificant on the average of all the seasons. Finally on page 53 the application of a $Z$ test, and the use of a standard error, in connexion with analysis of covariance should be brought up to date by the use of methods now in current use. J.W.

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†25 per cent reduction outside Germany.

CAULLERY, M. 575.1
Les conceptions modernes de l'hérédité. **(Modern ideas of heredity).**
E. Flammarion, Paris 1935 : 15 fr. Pp. 312. 49 figs.
The author's lectures on heredity elementary form the basis of this book which deals simply but adequately with the main conceptions underlying the modern teaching of genetics.
Technical terms are used where necessary but it is hoped that the book, besides being used by students, may prove of interest to a wider public and may help to correct some of the many common and current misconceptions of the subject. Special attention is given to the work on *Drosophila* and *Oenothera* and there is a short section that deals with human heredity.
A number of simple diagrams illustrate the book.

KOCH, F. 575.1
Das Mendelsche Gesetz für Züchter und Naturfreunde dargestellt. **(The Mendelian law for breeders and nature-lovers).**
Hachmeister and Thal, Leipzig 1934 : RM. 0.35.† Pp. 48. 11 illus.
A brief account, in German, of the elements of Mendelism. After describing the essentials of sexual reproduction, the disjunction of genes is illustrated by working out an example of monofactorial segregation without dominance. The rest of the story, dominance, bifactorial segregation and its different modifications, is then treated. There are also short sections on lethal genes, species and genus hybrids and the field of application of Mendelism.
The book concludes with a short list of more advanced textbooks and of periodicals.
To non-German readers who feel the need of a vocabulary of German genetical terms this inexpensive little book should be of value, for although no actual vocabulary is given the terms used are explained as they occur.

576.12
HURST, C. C. 575.1
**Heredity and the ascent of Man.**
University Press, Cambridge 1935 : 3*s.* 6*d.* Pp. ix + 138. 9 figs.
The author of this attractive small book gives an imaginative picture of the course of evolution from the origin of matter, successively through the origin of genes, life, sex, variation, man and conceptual intellect, to what he pictures as the later development of some transcendental form of spiritual life superseding man. In tracing the progress of this evolution from lower to higher forms the author contrives to give a very readable and at the same time concise and accurate account of the main cytological and genetical phenomena associated with life and introduces some interesting speculations on the nature of the gene and other forms of life. The biological aspect serves as a useful survey of modern genetical and evolutionary thought but in the light of the present state of civilization the predictions as to the future course of evolution might appear unwarrantably optimistic.

PLEYDELL-BOUVERIE, C. 576.12
**Objective evolution.**
Williams and Norgate, Ltd., London 1936 : 7*s.* 6*d.* Pp. 233.
An attempt to apply principles of evolution to social and political systems. The " evolution " concerned, however, is not that known to the ordinary biologist, but is evolution on a psychological plane.

SHULL, A. F. 576.12
**Evolution.**
McGraw-Hill Publishing Company, Ltd., London 1936 : 18*s.* 0*d.* Pp. + 312. 64 figs.
The author of this new treatise on evolution first reviews the evidence that evolution has occurred, starting with the groups into which all existing organisms naturally arrange themselves, with obvious relationships within the groups, particularly in embryonic and vestigial features, supported by the evidence based on geographical distribution. Next the evidence of the fossils is reviewed.

Consideration is then given to the mechanism by which a process of evolution could have been brought about. The phenomena and mechanism of heredity are therefore analysed, with rather particular attention to the origin of variation and especially the mechanism of mutation. The important role of the shifting of gene ratios by population changes is emphasized by reference to Wright's results, which leads to an analysis, in the light of modern data, of the principle of natural selection. After propounding the principle the author examines numerous ways in which it is supposed to work: protective and warning coloration, mimicry and the allied phenomena are reviewed critically, with reference both to a number of cases where the principles have been applied fantastically or uncritically and to others where there is strong justification, and so leading up to the revised theory of natural selection that is accepted by most modern geneticists. Finally the various effects, geographical, physiological, genetical, cytological, leading to isolation are analysed.

Further chapters are devoted to non-adaptive characters and various theories and difficulties associated with them, to the formation of geographical races and their bearing on the origin of species, and to a brief presentation of the theory of emergent evolution.

The book gives a clear and concise presentation of this controversial problem in accordance with the present genetical outlook, and as such should make a valuable contribution to biological student literature. It lays perhaps undue emphasis on the zoological aspect of the question and might with advantage have given a little more attention to purely plant phenomena such as the origin of new species by hybridization and especially the recent reproduction of a stage in the evolutionary process in the formation of amphidiploids.

SEIFRIZ, W. 576.311

**Protoplasm.**

McGraw-Hill Book Company, Inc., New York and London 1936: 36*s.* 0*d.* Pp. x + 584. 179 figs.

To bring between the covers of a book suitable for degree students a survey of all the relevant work on protoplasm with explanations of the physical and physico-chemical principles involved is indeed an immense task. The field covered is so vast that one can only give indications of the widely different topics treated, e.g. micrurgy, adsorption, viscosity, radiant energy, electrokinetics and so on; there is an interesting final chapter on the origin of living matter.

On controversial matters the author presents both sides of the question but does not attempt to be impartial. For those wishing to pursue a given topic further lists of references pertinent to each chapter are given.

The book should be of value as an introduction to a complex and fundamentally important study, concerning as it does " the basic material of life."

GAVAUDAN, P. and CHIH-CHEN, YU 576.313:585.1

Centrosomes et extrusions chromatiques chez les angiospermes. (**Centrosomes and chromatic extrusions in angiosperms**).

Hermann and Cie, Paris 1936: 15 fr. Pp. 48. 16 figs. 2 pls.

MARESQUELLE, H. J. 577.8

Problèmes du déterminisme génétique du sexe chez les plantes. (**Problems of genetic determinism of sex in plants**).

Hermann and Cie, Paris 1935: 12 fr. Pp. 63.

KOLTZOFF, N. K. 581.14:575

Physiologie du développement et génétique. (**Physiology of development and genetics**).

Hermann and Cie, Paris 1935: 12 fr. Pp. 55.

ROCHE, A. 581.192
La plasticité des protéides et la spécificité de leurs caractères. (**The plasticity of proteins and the specificity of their characters**).
Hermann and Cie, Paris 1935 : 12 fr. Pp. 52. 4 tables.

SOUÈGES, R. 576.35
La segmentation. Premier fascicule : I. Les fondements. II. Les phénomènes internes. (**Segmentation. Part 1 : I. The fundamentals. II. The internal phenomena**).
Hermann and Cie, Paris 1935 : 18 fr. Pp. 88. 24 figs.

SOUÈGES, R. 576.35
La segmentation. Deuxième fascicule : III. Les phénomènes externes. IV. Les blastomères. (**Segmentation. Part 2 : III. The external phenomena. IV. The blastomeres**).
Hermann and Cie, Paris 1936 : 16 fr. Pp. 80. 81 figs.

The first of these monographs represents a critical investigation of the claims of Feng Yen An to the discovery of the existence of centrosomes and even asters in *Lonicera alpigena*. The authors found neither centrosomes nor asters in their material but extrusions from the nucleolus may, under certain conditions, give an appearance somewhat resembling centrosomes. M. Maresquelle discusses the current views on sex determination in plants, he departs from Goldschmidt's view of quantitative differences between the sexes and inclines towards Mainx's idea of the sexuality of the haplont as quite other than that of the diplont. He admits, however, that the problem of the relation between the genetical and phenotypical determinism is not so proved. M. Koltzoff reviews briefly the physiological aspects of development and of genetics illustrated by the developing animal embryo; he discusses the theories of the older biologists and the more modern ideas and deprecates strongly any vitalistic interpretation.
Mlle Roche examines the proteins from the point of view of physiological chemistry and postulates the existence of a stable nucleus in the protein micella characteristic of each which limits the labile properties to the side chains of polypeptides.
M. Souèges considers in detail the problems of segmentation in all their aspects so that the work may form an introduction to the subject for intending investigators. Each section has its own bibliography.

PERCIVAL, J. 58
**Agricultural botany. Theoretical and practical.**
Duckworth, London 1936 : 8th Ed. 18*s*. Pp. xiv + 839. 265 figs.

The eighth edition has now been reached by this well-known text book which is intended for students of agriculture, gardeners and all who are interested in obtaining a sound working knowledge of botany as a basis for work with economic plants.
The text has been revised throughout and additions have been made, the chapters on the plant cell and the reproductive process thus providing the reader with an outline of the modern cytological and genetical aspects of cell division and mitosis and sexual reproduction in plants, including pollination and self and cross-fertilization. A number of new diagrams have been included in the explanation of male and female gamete formation and data on the chromosome numbers of certain plants are inserted.
The former standards have been maintained in regard to the arrangement of the text and the type, which is light but clear.
The book can again be cordially recommended as a text book for the student and also as a work of reference for the practical man and for use in agricultural colleges.

58
575

Robbins, W. W. and Isenbarger, J.

**Practical problems in botany.**

John Wiley and Sons, Inc., New York 1936 : 10s. Pp. ix + 402. 230 figs. (Chapman and Hall Ltd., London).

A textbook of botany for high school classes. As is indicated by the title the text maintains close contact with practical work and is interspersed with suggested practical exercises. The plan of the book as a whole is interesting, the whole subject being divided into ten " units," e.g. the organization and composition of plants, the nutrition of green plants, the nutrition of non-green plants, the growth of plants and so on ; each unit is sub-divided into problems and the detailed study of the problems of the unit is preceded by what is termed a preview of the unit. It will be seen that the title of the book has a real bearing on its contents.

The elements of nuclear division, mendelism, evolution by mutation and natural selection and economic plant breeding are described in the unit concerned with the development and improvement of plants and there is also a unit dealing with the economic importance of plants to man. The book as a whole represents an interesting departure from the usual type of elementary textbooks.

58(063)(42)

**Report of the Third Imperial Botanical Conference, London, August, 1935.**

Adlard and Son, Ltd., London 1936 : 1*s*. 0*d*. Pp. 20.

After a brief account of the Receptions, etc., a list of delegates and the President's address of welcome, a summary of the papers read is given. Wednesday, 28th August was devoted to pasture research and tropical forests, Thursday, 29th to problems of fruit storage and transport. On Friday, 30th papers were read on the collection and classification of crop varieties and related species, (cf. " Plant Breeding Abstracts," Vol. VI, Abst. 678), the application of ecological methods to the study of tropical agriculture and the furtherance of the scheme for the creation of liaison officers. In the last, Sir A. W. Hill stressed the importance of maintaining a close contact between the different Dominions and the Royal Botanic Gardens, Kew. Resolutions were passed urging the appointment of liaison officers by different Dominions, to work at Kew and also the exchange of members of the staff and research students between the Universities and research institutions of the Empire.

581.9(43)

Hueck, K.

Pflanzengeographie Deutschlands. (**Phytogeography of Germany**).

Hugo Bermühler, Berlin-Lichterfelde, 1935 : Published in 20 monthly parts at RM. 2.20 each : Complete, unbound RM. 44, bound RM. 50.†

A further five numbers (6-10) of this admirable work have now appeared, (Cf. "Plant Breeding Abstracts," Vol. VI, p. 330), in which the section on North Germany is completed and the section on Central Germany is begun. The same high standard of presentation and illustration is maintained.

582(038)

Niessen, J.

Rheinische Volksbotanik. Die Pflanzen in Sprache, Glaube und Brauch des rheinischen Volkes. Erster Band : Die Pflanzen in der Sprache des Volkes. (**Popular botany of the Rhineland. Plants in the language, beliefs and usage of the people of the Rhineland. Vol. I : Plants in the language of the people**).

Ferdinand Dümmlers, Berlin and Bonne 1936 : RM. 9.80.† Pp. 276.

After many years of work with the aid of a large number of collaborators the author has accumulated the necessary material for this compact and remarkably well arranged collection of the popular names used in the Rhineland for plants of all kinds including trees, vines, cereals, vegetables, weeds, etc.

The arrangement is alphabetical by the common name of the plant; then comes the botanical name (in large distinctive type) with numerous, popular, local and dialect forms including Dutch names, after which follows a description of the plant and in many cases the derivation of the appelation. Popular deviations and usages in proverbial sayings and local expressions in folk-songs and riddles, nursery rhymes, farmers' saws, etc. are also included and in many instances the practical or medical uses are mentioned.
In addition to an extensive list of the bibliographical sources of information, there are also alphabetical indexes of the botanical genera and of the authors of the plant names, as well as an explanatory list of botanical terms.
The apt use of cross-references and a key to the abbreviations used has resulted in a compact and useful work of reference which has been compiled for those requiring information on German botanical plant names.

585.421(54.8)
FISCHER, C. E. C. 633.1(54.8)
**J. S. Gamble's " Flora of the Presidency of Madras." Part X.*Gramineae.***
Adlard and Son, Ltd., London 1934 : 6*s.* 8*d.* (Rupees 4, a.8) Pp. 1689–1864.
This part of the Flora of Madras is perhaps of particular interest to those concerned with economic plants, including as it does such genera as *Saccharum, Sorghum, Panicum, Setaria, Pennisetum, Eleusine* and so on. Introduced as well as native plants are dealt with.
The genera are those adopted by Stapf in the " Flora of Tropical Africa " wherever possible, and the key to the genera is based on the same work.
Within each genus there is a key to the species, whose vernacular names in the different tongues are given. The uses to which certain species are put are briefly indicated.

GRIST, D. H. 63(91)
**An outline of Malayan agriculture. Malayan Planting Manual No. 2.**
Published by the Department of Agriculture, Straits Settlements and Federated Malay States, Kuala Lumpur 1936 : 7*s.* 0*d.* [ $3 (Straits Currency)]. Pp. xiii + 378. 86 pls. 2 maps.
Intended to serve as an authoritative textbook and work of reference, this comprehensive summary of Malayan agriculture has been compiled by the Agricultural Economist and Editor of publications of the Straits Settlements and Federated Malay States Department of Agriculture, with the assistance of specialists in this and other Departments in the Malayan Civil Service.
The volume is divided into six parts, dealing respectively with agricultural conditions, agricultural practice, major crops, secondary crops, minor crops and stock. There are also appendices dealing with import and export duties, bibliography and Malayan weights and measures. A geological and a political map of the Malayan peninsula are provided and there is also an index.
The chapters on the major crops, rubber, coconuts, rice, oil palms and pineapples contain brief references to breeding work (cf. " Plant Breeding Abstracts," Supplement II).
The production of the book is excellent and while it will no doubt be in greatest demand in Malaya it will form a valuable addition to any library on tropical agriculture.

SAMPSON, H. C. 633
**Cultivated crop plants of the British Empire and the Anglo-Egyptian Sudan (tropical and sub-tropical).**
Kew Bull., Addit. Ser. XII Kew 1936 : Pp. viii + 251. Price 6*s.* 6*d.*
A large amount of useful information is contained in this bulletin, which is based on the replies to a questionnaire issued by the Director of the Royal Botanic Gardens, Kew, and forwarded by the several Departments of State concerned to all tropical and sub-tropical countries of the Empire and to the Anglo-Egyptian Sudan.
A list of the plants is given in alphabetical order of the genera, with the species of each genus, also alphabetically arranged. The common names and vernacular names in different languages

are given and the countries in which the plants are grown, with an indication of whether they are indigenous, successful introductions, under trial, and so on.
This list occupies the major part (180 pages) of the bulletin but there are a further 60 pages of notes dealing with some of the more important crops and two appendices, one giving an index of commonly used synonyms and the other a copy of the questionnaire.
The bulletin as a whole should prove of immense value to all concerned with tropical and sub-tropical agriculture.

FLAKSBERGER, K. A. 633.11
**(The wheats. A monograph).**
Ogiz, Moscow and Leningrad 1935 : 5 roubles 30 kopecks : Pp. 261. 74 illus. 1 map.
In this small Russian monograph on wheat the plant is dealt with in all its aspects by one of the world's authorities on this cereal. The derivation of its name in innumerable languages, the uses of wheat, its milling and baking quality, structure and composition of the grain and geographical distribution of wheat are some of the more general aspects dealt with in brief in the early chapters. A full botanical and agronomic description of the plant is then given, with chapters on classification, cytology, the distribution of the species and varieties and their origin. A further chapter is devoted to the breeding and genetics of wheat and the pedigrees of a number of outstanding varieties are given. There follow full descriptions of all the main varieties, with illustrations and indications of their origin. This will probably be found to be one of the most useful features of the book. For each variety are indicated the regions in the U.S.S.R. where it can be cultivated.
The book is provided with a number of useful charts and a selected bibliography to each chapter.

SORNAY, P. DE 633.61
Manuel de la canne à sucre à l'usage des chargés de cours et des élèves des grandes écoles coloniales. **(Sugar cane manual for the use of lecturers and students of colonial colleges).**
The General Printing and Stationery Co., Ltd., Mauritius, 1936 : Pp. ii + 330. 11 illus. 20 pls.
Although intended for the use of teachers and students of tropical agriculture the ground covered is more extensive than is possible in the usual course and though in no way intended as a treatise on the subject it is hoped that it may prove of use to all who are taking up work with sugar cane in the colonies.
A very general description of the botanical features of the plant is followed by an account of the cultural methods based chiefly on the author's own experience in Mauritius but with descriptions of the practices in other cane-growing countries.
The most important diseases of the sugar cane are also briefly considered.
The book is illustrated by photographs and some very clear diagrams.

WOLF, F. A. 633.71–2
**Tobacco diseases and decays.**
Duke University Press, Durham, N. Carolina. 1935 : 22*s.* 6*d.* Pp. xix + 454. 111 illus. 13 tables.
Not only are the diseases of the growing plant considered in this important work but there is also included a brief section on the decays to which the plant is subject after it is harvested.
The diseases are divided into : (1) those caused by living organisms, (2) those whose causes are non-living, and (3) those caused by viruses.
The information available for each disease is fully given and where the amount of data and the importance of the diseases allow, it is divided into the plant attacked, the symptoms, an account of the causal organism and the measures of protection and control.

The problem of seed bed infection is specially considered and one of the many useful features is that all the forms of the names (whether English or foreign) of diseases are given.
No such comprehensive work on tobacco diseases exists and it should prove indispensable to any grower of tobacco.
Besides lists of relevant literature at the end of each section there is an inclusive bibliography covering 51 pages.

633.85
BAUR, G. 633.5
Raps, Lein und andere wichtige Öl- und Gespinstpflanzen. (**Rape, flax and other important oil and textile plants**).
Eugen Ulmer, Stuttgart 1935 : RM. 1.50.† Pp. 53. 24 illus.
A manual suitable to the needs of the practical man who is interested in the cultivation of oil and textile plants. The plants dealt with include rape (*Brassica Napus oleifera*), turnip rape (*Brassica Rapa oleifera*), poppies (*Papaver somniferum*), mustard, flax and hemp. The various cultural operations are systematically described with remarks on the selection of suitable varieties, yield and utilization of the crop. A number of illustrations are included.

FLAMM, S. AND KROEBER, L. 633.88
Die Heilkraft der Pflanzen, ihre Wirkung und Anwendung. (**The healing power of plants, its action and use**).
Hippokrates-Verlag G.m.b.H. Stuttgart, Leipzig 1936 : 2nd Ed. Unbound RM. 4.85, Bound RM. 5.25.† Pp. 274. 118 illus. (32 coloured pls.).
The medicinal plants of Germany are here arranged in alphabetical order, according to their common names, described in simple terms and their action and use in medicine are given as well as the homeopathic dosages.
Each plant is illustrated by a drawing and there are coloured plates illustrating 32 of the plants. There are indexes of the common and latin names and of the diseases mentioned in the text.

MEYER, E. 633.88
Pflanzliche therapie. (**Phytotherapy**).
Georg Thieme, Leipzig 1935 : RM. 4.80.† Pp. 202.
After a general section on phytotherapy and its uses, a special section deals with diseases and the plants providing drugs for their relief. The pharmaceutical prescriptions are given at the end of the book. The book should prove of value to anyone interested in the relation of plants to medicine.

TRENKLE, R. 634
Obstbau-Lehrbuch. I Teil : Neuzeitliche Obstkultur. (**A textbook of fruit-growing. Part I : Modern fruit culture**).
Rud. Bechtold and Comp., Wiesbaden 1935 : Pp. viii + 312 + xvi. 144 figs.
This book which deals only with the most important and modern problems of fruit culture begins with a short section on the economics of fruit growing and then goes on to the botany of fruit trees in general. The major part of the book is concerned with practical fruit cultivation and most particularly with pome and stone fruit and nuts while the berries are given only 14 pages.
Part II which is to follow will deal with the harvesting, storage and use of the fruit.

ZEDERBAUER, E. 634
Handbuch des Obstbaues. (**A manual of fruit-growing**).
C. Gerold's Sohn, Wien, Leipzig 1936 : Unbound RM. 15.30, Bound RM. 17.†
Pp. 552. 195 illus. 61 tables.
The author's lectures have been extended into a manual of fruit cultivation not only as a textbook for students but for the use of fruit growers in Austria and Central Europe.
As a full treatment of the entire subject is not possible the crops described are limited to pome and stone fruits, berries and nuts.

The first section describes the species and varieties and the second gives general information on the structure and growth of the trees and their cultivation.
An extensive part is devoted to the diseases of fruits, and where possible, the methods for the control.
Finally the uses of the fruit are considered and general directions given for harvesting, packing and storing.
The book is amply illustrated with original drawings.

634.11(063)(42)
634.13(063)(42)

**Apples and pears. Varieties and cultivation in 1934. Report of the Conference held by the Royal Horticultural Society at the Crystal Palace, September 19-21, 1934.**

Royal Horticultural Society, London 1935 : 7*s.* 6*d.* Pp. iv + 213. 33 figs.

The report contains the following articles of interest to breeders :—

*Pollination in apples, pears and plums.* (*pp. 38-46*)

An account of the pollination problem from the grower's point of view. Lists of varieties in order of flowering are given, with indications of which are suitable for planting together for pollination purposes.

*The basis of classification in apples and pears.* (*pp. 47-89*).

Mr. E. A. Bunyard describes the principles of his system of classification of apples and pears. Emphasis is placed on leaf and flower characters.
Mr. H. S. Rivers gives observations on nomenclature : the present system, it is suggested, will not easily be improved.
Dr. H. E. Durham outlines a code system of letters and numbers for describing and identifying the fruits of apples and pears.
Other members make brief observations on the complex problem of classification in these fruits.

M. B. Crane. *The origin of cultivated fruits and the raising of new varieties.* (*pp. 90-97*).

The different modes of origin of many of our fruits are briefly reviewed, the methods mentioned being gene mutation and selection within a diploid species (e.g. peaches, nectarines and some raspberries) ; interspecific hybridization without chromosome duplication (e.g. red currants) ; autopolyploidy (e.g. some raspberries) ; interspecific hybridization between polyploid forms (e.g. the garden strawberry) ; interspecific hybridization accompanied by the functioning of unreduced germ cells or by chromosome duplication (e.g. the domestic plum, " Duke " cherries and several *Rubus* forms).
The genetics and cytology becomes more complex in the more complex types, especially in the apples and pears, which are secondary polyploids, and the systematic classification shews a corresponding increase in difficulty.

A. D. Hall. *The National Fruit Trials.* (*pp. 121-26*).

A brief account of the fruit trials run by the Ministry of Agriculture and the Royal Horticultural Society at Wisley and ten sub-stations. The crops dealt with are apples, pears, plums, cherries, raspberries and blackberries, red and black currants, gooseberries, strawberries and nuts. They have now been in progress for twelve seasons and while the results with tree fruits are as yet only tentative at most, with bush fruits some definite conclusions have been reached, brief indications of which are given in the present paper.

A. N. Rawes. *New varieties of apples and pears.* (*pp. 126-35*).

Observations, based on experience at Wisley, on promising new varieties. Several varieties of apples, dessert, cooking and dual purpose types, are mentioned but there are few new varieties of pears and only two have reached good bearing age at Wisley.
A list is given of the new varieties with their respective raisers, introducers, parentage, season and awards won.
In the discussion Mr. P. Norbury stresses the advantages to growers of taking a chance with a promising new variety rather than waiting many years until it has been thoroughly tested.

R. G. Hatton *Rootstocks for pears.* (*pp. 154-66*).
Observations on the behaviour of different rootstocks for pears at East Malling. At least four varieties of quince rootstocks were recognized and four of free pear stocks (seedling pears), shewing different behaviour. The variety of scion used also affects the results.

E. A. Bunyard. *Foreign apples.* (*pp. 209-11*).
Some of the foreign apples exhibited at the conference are briefly commented on and questions of synonymity are raised.

A. Janson. *Apples in Esthonia.* (*pp. 212-13*).
The major problem is to find a dessert variety with good keeping quality and the great hardiness required for Esthonian conditions.
The Canadian variety Ontario has proved very hardy and it has also been crossed with a promising Danish variety, Signe-Tillish. Other promising varieties mentioned are Laxton's Superb, Minister von Hammerstein and Treboux.
Also included in the report is an extensive list of the apple varieties at the conference with indications of their source, use, season, size, shape and colour.
The report concludes with an index to authors and subjects.

634.23(42)
634.7(42)

**Cherries and soft fruits. Varieties and cultivation in 1935. Report of the conference held by the Royal Horticultural Society at the Greycoat Street Hall, July 16 and 17, 1935.**

Royal Horticultural Society, London 1935 : 6*s.* 0*d.* Pp. 164. 15 figs.
The complete report of a conference on cherries and soft fruits held by the Royal Horticultural Society in July, 1935. It contains the following papers of interest to plant breeders :—

L. Doubleday. *Cherries for market-growing purposes.* (*pp. 6-10*).
Includes observations on varieties and the need for suitable pollinators and a list of recommended varieties.

E. A. Bunyard. *Cherries and their varieties.* (*pp. 11-23*).
A paper on the classification of cherry varieties. They are divided into sweet, (descended from *Prunus Avium*), sour, (descended from *P. Cerasus*) and intermediate or Duke cherries. The sweet cherries are further subdivided into the tender-fleshed Geans or Guignes, white or black, and the firm-fleshed Bigarreaux, white or black ; the sour cherries are divided into the black Morellos and the transparent, red Amarelles ; the Dukes also have a red and black group and include some of the best garden cherries.
The succession of varieties within each group is described, with observations on synonymity and after a few remarks on cultivation the paper concludes with a select list of cherries for garden use.
The discussion on the preceding papers includes further observations on varietal questions.

R. Vinson. *Growing healthy strawberries.* (*pp. 24-51*).
In the discussion on this paper Dr. Swarbrick emphasizes the importance of selecting vigorous, healthy strains and gives observations on varieties and on the importance of pollination in the case of a partially self-sterile variety like Oberschlesien or Huxley or a male-sterile variety like Tardive de Leopold. It is mentioned that pollination of Tardive de Leopold by Royal Sovereign gives a conical fruit while pollination by Huxley gives wedge-shaped to round fruits.

R. V. Harris. *Growing healthy raspberries—the control of diseases and pests.* (*pp. 95-113*).
The existence of varietal differences in resistance to virus diseases and the importance of breeding new resistant varieties are briefly mentioned.

A. N. Rawes. *Soft fruits for the private garden.* (*pp. 114-20*).
Varieties of strawberries, raspberries, red, black and white currants, gooseberries and blackberries are recommended.

M. B. Crane. *Blackberries, hybrid berries, and autumn-fruiting raspberries.* (*pp. 121-28*).
The qualities of the following British blackberry species are briefly described: *Rubus thyrsiger* (2n = 28), *R. nitidioides* (2n = 28), *R. Borreri* (2n = 42), *R. laciniatus* (2n = 28), *R. rusticanus* (2n = 14) including the form *inermis*, *R. Schlechtendahlii* (2n = 28), *R. calvatus* (2n = 28) and *R. procerus* (2n = 28). The blackberry " John Innes " was raised from the cross *R. rusticanus inermis* x *R. thyrsiger* and is tetraploid (2n = 28).
The origin and qualities of the following new *Rubus* forms are also briefly mentioned: Cory Thornless, apparently a bud sport from the blackberry variety Mammoth or Lowberry. It is hexaploid (2n = 42) and probably a periclinal chimaera. The Mahdi (2n = 21), product of a cross between a raspberry and a hedgerow blackberry, is not very productive. The Veitchberry (2n = 28) has a similar origin but is very fertile and productive. Bedford Giant (2n = 42) from a selfed Veitchberry seedling crops freely and is a vigorous grower. The Loganberry (2n = 42) is now believed to have arisen from the union of an unreduced gamete from a diploid raspberry with a normal gamete of *R. ursinus* (2n = 56). A certain amount of variation between different stocks of Loganberry is attributed to occasional sexual reproduction. The Phenomenal Berry (2n = 42) resembles the Loganberry and arose from a cross between the western dewberry and a raspberry. The Laxtonberry (2n = 49), from a cross between the Loganberry and the raspberry variety Superlative, is only moderately fertile.
The chromosome numbers of some 12 varieties of autumn-fruiting raspberries are given. For the most part these are polyploids. It is suggested that the tetraploids arose by duplication without hybridization, while the triploids arose by subsequent hybridization, between the autotetraploids and diploid varieties.
In connexion with the origin of cultivated forms of *Rubus* the functioning of unreduced germ cells appears to be of major importance.

A. B. Beakbane. *Blackberries and Loganberries.* (*pp. 129-32*).
In a consignment of 160 Loganberries bought from a reliable commercial source there were only four plants identical with the description and photograph of the original Loganberry. The variation, which supports the suggestion in the previous paper that sexual reproduction has occurred from time to time, affected cane, leaf, flower and fruit characters, time of blossoming and fruiting, vigour and disease resistance. Though some of the variations are chiefly of botanical interest others are of considerable commercial importance; the consignment included for instance Laxtonberries and Phenomenal Berries.
A certain amount of variation of a similar nature also appears to have occurred in commercial varieties of blackberries.

A. N. Rawes. *Soft fruits. Notes on varieties under trial at Wisley.* (*pp. 133-37*).
Contains observations on the behaviour of new varieties of black and red currants, raspberries and other *Rubus* forms, strawberries and gooseberries at *Wisley*.

H. Selby. *Commercial cultivation of the gooseberry.* (*pp. 138-47*).
*Inter alia* the different popular varieties are considered.

W. B. Adam. *Varieties and quality of fruits required for canning.* (*pp. 148-56*).
Contains observations on the canning performance of varieties of apples, plums, damsons, cherries, blackberries, dewberries, raspberries and other *Rubus* forms, gooseberries, black and red currants and strawberries. A list of the varieties approved for National Mark Canned Fruits is given.
An index to the report is provided.

634.51

WAGNER, O. 634.54

Der Walnussbaum und der Haselnussstrauch. Anleitung für sachgemässe und vermehrte Anpflanzung. (**The walnut tree and the hazelnut bush—a guide to systematic and increased planting**).

Paul Parey, Berlin 1935 : Pp. 62. RM. 2.† 22 illus.

Written with the object of promoting walnut and hazelnut growing, this practical and informative booklet lays no claim to be based on a scientific study of the biology of these two trees. It aims at providing the necessary instructions for growers, on questions relating to the best type of seed, sowing, rearing the trees, grafting, the selection of varieties, suitable sites for planting, harvesting the crop, and in the case of the hazelnut there is a short section on pollination process. The economic aspects of nut growing in Germany are considered.

The print is clear and there are good illustrations and as a horticultural manual the book is to be recommended.

COOKE, F. C. 634.61(91.4)

**The coconut industry of the Philippine Islands. Report on a visit to the Philippine Islands for the purpose of studying the conditions of the coconut industry.**

Dep. Agric. S.S. and F.M.S. 1936 : Gen. Ser. No. 23 : Pp. 101. 12 pls. 29 tables. Price 50 cents.

An account of the agricultural, commercial and economic aspects, based on a visit made in 1934 for the purpose of studying the coconut industry in the Philippines.

On the economic side the reasons for the growth and recent decline of the industry are traced. The cultivation practices, methods of producing copra and manufactured products such as oil, edible fats, soap and desiccated coconut are also described.

MARKHAM, E. 634.71

**Raspberries and kindred fruits. How to obtain fresh supplies daily from June to November with chapters on the loganberry, hybrid berries and giant blackberries.**

McMillan and Co., Ltd., London 1936 : 6*s.* 0*d.* Pp. vii + 68. 10 pls.

The types treated are summer-fruiting and perpetual or autumn-fruiting raspberries, black raspberries or black caps, the loganberry and other hybrid berries and the giant blackberries.

Though the book is quite short the text is thorough and covers the questions of cultivation, varieties, insect pests and diseases with suggestions for their control. There is also a chapter on forcing raspberries.

The author is very enthusiastic about the merits of the perpetual-fruiting raspberries and considers them worth much more attention than they at present receive.

The book is illustrated by some admirable photographs.

TOPPEL, J. 634.771

Die Banane. (**The banana**).

Dr. Bodenbender Berlin-Steglitz 1935 : RM. 10.† Pp. xvi + 186. 43 illus.

A work of general interest on the banana including a brief survey of its history, origin, distribution and uses : an account of its cultivation in the countries where it is grown, statistics concerning its production and export, with special reference to German trade in bananas, before, during and after the war.

MCMINN, H. E. and MAINO, E. 634.97(79)

**An illustrated manual of Pacific Coast trees.**

Univeristy of California Press, Berkeley, U.S.A. 1935 : 16*s.* 0*d.* Pp. xii + 409. 415 figs. 1 pl. (Cambridge University Press, Great Britian and Ireland).

The book is produced on classical lines, starting with introductory chapters explaining the terms used and describing the origin and distribution of Pacific Coast trees ; this is followed by a key

to the genera, based mainly on vegetative characters, while the main part of the book is concerned with descriptive accounts of the trees. These are grouped under their respective families, a relationship which does not emerge in the key to the genera. In each genus a key to the species is given and a great many of the latter are illustrated by admirable drawings or, in the case of the monocotyledons, photographs.

Additional valuable features at the end of the book are a glossary, a list of additional native species which occasionally are tree-like and lists of trees recommended for various uses on the Pacific Coast; the last named lists were supplied by H. W. Shepherd, Associate Professor of Landscape Design in the University of California. There is also a comprehensive index.

The book is well bound between pliable covers, with maps of the coastal states of the U.S.A. and British Columbia on the cover pages; the printing is excellent.

635(058)(43)

Reichsadressbuch des deutschen Gartenbaus. (**Official address book of German horticulture**).

W. Rohscheid, Berlin-Neukölln 1935: Vol. I: Pp. 304 + 68. Vol. IV: Pp. 118 + 48. RM. 6† (per volume).

The reorganization of Germany under the National Socialist Workers' party has brought with it many changes in the social structure and innovations in the organization of agriculture and horticulture. With the establishment of the State Food Board (Reichsnährstand) and the relevant legislation whereby it is enacted that all horticulturalists must belong to the Board and follow its directions, the old societies and associations were no longer needed.

In volume I of this directory names and addresses are given of persons who, under the state organization are connected with horticulture in east and central Germany. Since any horticulturalist desiring information relating to technical and economic aspects of his work must apply for it through certain defined channels of communication, the value of the information supplied is obvious.

Volume IV, forming a supplement, gives information on official bodies, the State Food Board, Government and other Educational Institutes, with particulars relating to public works (e.g. gardens, castles, etc.) and to various societies for the development of German horticulture in its various aspects.

Kosmin, N. P. 664.641.016

Das Problem der Backfähigkeit. (**The problem of baking capacity**).

Moritz Schäfer, Leipzig 1936: RM. 7.50.† Pp. 191. 39 illus. 74 tables.

The problem of the quality of the flour is here considered from a biochemical standpoint and the book is intended as a guide to millers and bakers towards an understanding of the various biochemical processes involved in bread-making.

The book, which is well bound and printed, should prove of value to the student of the technology of baking.

## NEW JOURNALS.

### Biodynamica.

A Scientific Journal for the Elaboration and the Experimental Study of Working Hypotheses on the Nature of Life.

In an introductory page the function of this journal is described as "the publication of papers dealing with working hypotheses on the nature of life and with the experimental study of these hypotheses." Papers will be accepted in any of the languages recognized for scientific publication and each paper constitutes a separate leaflet bearing its own issue number and its own pagination. The journal is not published at regular intervals but as material develops. The first issue was in October 1934 and up to the present there have been three issues, containing fifteen papers.

The project is an ambitious one and deserving of every success. (Published by "Biodynamica," Normandy, Missouri, U.S.A. at irregular intervals).

**Der Forschungsdienst.**

(Research service).

The " Deutsche landwirtschaftliche Rundschau " formerly one of Germany's principal journals dealing with research is now replaced by " Der Forschungsdienst." The new journal is to act as a link whereby the results of German scientific research and in particular agricultural investigations, will be made available to the researcher and to the practical worker and the general reader.

The range of subjects covered in the main articles is extremely wide and there is an abstracting section in which numerous German and other periodicals relating to agriculture in general, agricultural economics, horticulture, forestry, field crops, animal husbandry and breeding, agricultural industries, sciences in general and medicine are summarized.

Separate special numbers by experts are also issued from time to time on particular problems or aspects of agriculture.

The general tendency in the presentation of the various subjects dealt with in main articles is instructive without however being superficial or wholly popular. (Published by J. Neumann, Neudamm and Berlin, Annual Subscription RM. 36, issued fortnightly).

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# IMPERIAL AGRICULTURAL BUREAUX

**Executive Council.**
2, Queen Anne's Gate Buildings, London, S.W.1.

**Imperial Bureau of Soil Science.**
Rothamsted Experimental Station, Harpenden, Herts.

**Imperial Bureau of Animal Nutrition.**
The Reid Library, Rowett Institute, Bucksburn, Aberdeen.

**Imperial Bureau of Animal Health.**
Veterinary Laboratory, New Haw, Weybridge, Surrey.

**Imperial Bureau of Animal Genetics.**
King's Buildings, University of Edinburgh, Scotland.

**Imperial Bureau of Plant Genetics (for Crops other than Herbage).**
School of Agriculture, Cambridge.

**Imperial Bureau of Plant Genetics (Herbage).**
Agricultural Buildings, Alexandra Road, Aberystwyth.

**Imperial Bureau of Fruit Production.**
East Malling Research Station, East Malling, Kent.

**Imperial Bureau of Agricultural Parasitology.**
Winches Farm, Hatfield Row, St. Albans, Herts.

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Plant Breeding Abstracts are issued quarterly at an inclusive price of 15/- per annum, single copies 5/-. Subscriptions or exchanges should be sent to the Deputy Director, Imperial Bureau of Plant Genetics, School of Agriculture, Cambridge, England.

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